RUBBER MANUFACTURERS ASSOCIATION

2005 EDITION

SCRAP TIRE MARKETS IN THE UNITED STATES

November 2006

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Rubber Manufacturers Association

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 representing nearly 100 companies that manufacture various rubber products. These member companies include every major domestic tire manufacturer including: Bridgestone 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; Toyo Tire North America, Inc. 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.

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Executive Summary

This report is the eighth in a series of biennial reports analyzing the state scrap tire management in the United States. Since the report's inception, scrap tire market, generation and stockpile data were provided in "millions of tires." This report continues to provide these data in "millions of tires." This edition of the report, however, provides a new feature as well. Data are also provided by "weight," in thousands of tons.

Market Overview

In 2005, nearly seven-eighths of the 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 259 million tires. RMA estimates that about 299 million tires were generated in the U.S. in 2005. This represents nearly an 8-fold increase in the percentage scrap tires going into markets annually since 1990. By weight, RMA reports that 82 percent of scrap tires were consumed by end use markets.

Scrap tires were consumed by a variety of scrap tire markets, including tire-derived fuel, civil engineering and ground rubber applications. Other smaller markets and legal landfilling consume to remaining annually-generated tires.

Tire-Derived Fuel (TDF)

In this application, scrap tires are used as a cleaner and more economical alternative to coal as fuel in cement kilns, pulp and paper mills and industrial and utility boilers. TDF accounted for about 155 million scrap tires in the U.S. in 2005, or about 52 percent 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 continued growth in the next two years.

Civil Engineering

The civil engineering market consumed over 49 million tires in 2005, about 16 percent 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 beneficial properties in these applications, such as vibration and sound control, lightweight fill to prevent erosion and landslides and facilitate drainage in leachate systems. This market experienced a slight decrease since 2003, due to competition with TDF markets.

Ground Rubber Applications

This market consumed nearly 38 million tires in 2005, or about 12 percent of the scrap tires generated. Ground rubber applications include new rubber products, playground and other sports surfacing and rubber-modified asphalt. The sports surfacing market was the most dynamic segment in the ground rubber market during this period. This market is illustrated on the cover of this report, shown on a school running track. 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 experience modest growth in the next two years.

Stockpile Abatement

At the end of 2005, 188 million scrap tires remained in stockpiles in the United States, a reduction of about 81 percent 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 seven states: Colorado, New York, Texas, Connecticut, Alabama, Michigan and Pennsylvania. These states contain 85 percent of the scrap tires remaining in stockpiles. Of these states, Alabama and New York have ongoing abatement programs, while Texas has recently completed an abatement effort. RMA continues to work with legislators and regulators in these states to develop and implement effective scrap tire programs to address these stockpiles.

State Performance

For the first time, RMA has evaluated state scrap tire management performance and created two ranking categories: performance and improvement. In the performance category, South Carolina, Maine and North Carolina were the top three states in 2005. These states have robust scrap tire markets and few, if any, remaining scrap tires in stockpiles. The three most improved states since 2003 are Texas, Alabama and Ohio.

RMA recognizes these three states for increases in the scrap tires going into end-use markets and for significant progress in stockpile abatement. While scrap tire stockpiles continue to pose challenges in these states, significant progress was achieved in 2004 and 2005. Additionally, Alabama recently initiated abatement projects in 2006.

Regional Markets

Scrap tire markets remain regional in nature. In this report, RMA analyzed regional scrap tire management and market trends by U.S. EPA Region. Scrap tire markets remain strong in the mid Atlantic and Southeast, fueled by expanding TDF markets. Several pockets of stable and strong markets exist in the middle of the country. In the western half of the country, markets are challenged by geography and population – large expanses of land separate population centers, thus complicating transportation of scrap tires to available potential markets. Although some areas with developed markets do exist in the West, transportation costs serve as a limiting factor in market growth in this region.

Outlook

Scrap tire management in the U.S. has made considerable progress since 1990, when the RMA began to address the issue. In 2005, more scrap tires were consumed in markets 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 2006 – 2007 timeframe.

Scrap tires in stockpiles have been reduced by over 81 percent 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.

1

Introduction

This edition of the Report on the U.S. Scrap Tire Markets is the eighth biennial report on scrap tire markets researched and published by or on behalf of the RMA 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 2005, analyzes the various U.S. scrap tire 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 by stakeholders 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 presented in this report are a culmination of questionnaires completed by state scrap tire regulators and extensive phone interviews with scrap tire processors and others involved in scrap tire management activities.

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. These components pose distinct challenges and opportunities. Therefore, this report addresses them separately.

A broad array of market opportunities is 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. Annually-generated tires can be properly absorbed into the marketplace more readily than stockpiled tires in most regions.

On the other hand, tires abated from stockpiles can be dirty and difficult to process. If disposal fee was collected at the time a scrap tire was stockpiled, the money usually has long since been spent. Accordingly, state funds often are necessary to abate stockpiles. Some markets are available for stockpiled tires, primarily some TDF and civil engineering applications. However, other markets are often precluded by the condition of stockpiled tires.

Data Collection

The information provided in this report is based on several data collection efforts. In coordination with the U.S. EPA Resource Conservation Challenge (RCC) Tire Workgroup, an initiative focusing on scrap tire issues (discussed in more detail in Chapter 11 of this report), RMA developed and sent a questionnaire to all state scrap tire regulators. Responses to this questionnaire provided the basis for the market and stockpile inventory data and analyses contained in this report.

For the first time, RMA made this questionnaire available to be completed on-line in an interactive format. RCC Scrap Tire Subcommittee members contacted fellow state regulators to offer assistance to states completing the questionnaire.

Additionally, RMA staff conducted an extensive telephone survey with 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 fully reflected in questionnaire responses. 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 for scrap tires. Since its inception, this report has contained scrap tire generation and market data expressed in terms of units the number of scrap tires generated and consumed by markets, regardless of size or weight. This methodology was consistent with the first substantial report on scrap tire management completed by the U.S. Environmental Protection Agency (EPA) in 1990.

However, some governments (states, regions and countries) collect and report scrap tire data in terms of total weight, rather than in units. As well, some other tire industry organizations that report scrap tire data do so in terms of weights. Additionally, the RCC Tire Workgroup has recommended that RMA data either be collected or converted to a weight basis.

The RMA Scrap Tire Committee reviewed all of the issues associated with starting to collect and report scrap tire data in terms of weights. The Committee agreed that RMA should collect scrap tire market data from states in terms of both weights and units for this report. The scope of this report is limited to those tires DOT-certified for on-road use.

It is important to note that the 2005 data using a weight-based approach may not be comparable to the previous data collected based on units. In this report, RMA limits the impact of this by reporting the data in terms of units as well, which also will facilitate public communication efforts.

Comparisons to data from previous years are made only in terms of units. In the interest of greater consistency and precision of data, however, the change to weight-basis accounting is necessary. Reporting in terms of weight also will facilitate greater consistency between RMA data for the U.S. and scrap tire data available for other geographic regions.

RMA appreciates the work of the RCC Tire Work Group Goals Subcommittee in this area. This group endorsed RMA's approach in this report. As previously mentioned, this report presents data by both weight (1,000s of tons) and units (millions of tires).

There are four reasons for dual data reporting. First, the data on scrap tire generation that was collected was reported in tire units. Second, in order 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. Having current and future data in both weight and units allows for a historical comparison. Third, it would most likely cause significant confusion if this report suddenly described all results in terms of weight only. Finally, the change in accounting systems could inappropriately characterize market trends if no transitional benchmarking between the two systems were provided.

Developing a Weight-Based Approach

In order to begin publishing scrap tire market and information statistics in terms of total weight ("thousands of tons" is the metric used in this report), RMA needed to calculate an average weight across all scrap tire categories. Due to the difficulty in obtaining broad, representative weight information across the U.S. new tire market, RMA chose instead to collect information from various scrap tire processors throughout the country.

RMA surveyed six scrap tire processors to determine average scrap tire weights for two broad classes of scrap tires: light duty tires (including passenger and light truck categories) and commercial tires (including medium, wide base and heavy truck and bus tires). For the light duty category, the average scrap tire weight is 22.5 pounds. This number serves as the revised passenger tire equivalent ("PTE") value, described in greater detail later in this chapter. For the commercial tire class, the average reported scrap tire weight is 110 pounds.

RMA used these two values to calculate an average tire weight across all classes of tires certified for on-road use by the U.S. Department of Transportation.

Table 1: Average Scrap Tire Weight Calculations for U.S. Market.

Tire Class	*Millions of Tires*	*Market Percent*	*Weight (lbs)*
Light Duty Tires	**264.2**	**88.20%**	**22.5**
Passenger tire replacements[1]	*202.3*	*67.53%*	
Light truck tire replacements[1]	*36.0*	*12.02%*	
Tires from scrapped Cars[2]	*25.9*	*8.65%*	
Commercial Tires	**35.3**	**11.80%**	**110**
Medium, wide base, heavy truck replacement tires[1]	*17.8*	*5.94%*	
Tires from scrapped trucks and buses[2]	*17.6*	*5.86%*	
Total scrapped tires	**299.6**	**100.0%**	**32.8**

[1] 2005 RMA Tire Industry Facts, Factbook 2006. Industry total replacement tire shipments.

[2] Ward's Motor Vehicle Facts and Figures, 2006. Includes the number of vehicles removed from service in the car/light truck, truck and bus categories in 2005. Assumes 4 tires scrapped from light duty vehicles and 5 tires scrapped from trucks and buses.

As illustrated in Table 1, the average tire weight in the United States across all on-road tire categories and classes is 32.8 pounds. Due to precision limitations inherent in these calculations, RMA then rounded this number to the nearest whole number for purposes of converting data provided in terms of "millions of scrap tires" to weights. Consequently, in every instance where a conversion from units to weights was necessary, 33 pounds was used to represent the average weight of a scrap tire.

Revised Passenger Tire Equivalent (PTE) Value

The "passenger tire equivalent" or "PTE" has become a valuable tool used to estimate scrap tire weights and volumes for a variety of purposes, including assessing scrap tire stockpiles and scrap tires used in market applications. Historically, the scrap tire community, including industry and regulators, has used an average scrap tire weight of 20 pounds to represent one PTE. This standard for PTE is no longer valid, since tire sizes are trending larger.

In order to revise the PTE to reflect current tire sizes, RMA staff contacted six of the largest scrap tire processors in the U.S. RMA obtained average tire weights for the scrap passenger and light truck tires received by each company within a limited period of time. RMA found that the average scrap weight for passenger and light truck tires is fairly consistent throughout the country. The average tire weight for passenger and light truck tires in this study was 22.5 pounds. RMA recommends that this new value be used as the revised standard PTE value in the United States.

Characterizing the Data

States provided data to RMA in a variety of formats – number (millions) of tires, PTEs and weights. States were asked to specify which format represented the data provided. Many states reported in inconsistent formats across the various reporting categories – annual scrap tire generation, stockpiled tires and tires to the various markets. By necessity, RMA developed conversion equations in order to present the data in "millions of tires" (units) and "thousands of tons" (weights). Table 2 shows the distribution of data formats RMA received across the various data collection categories.

Table 2: Characterization of State Data – Number of States Using Various Units to Report Data.

Data Category	*Millions of Tires*	*PTEs*	*Weight*
Generation	35	12	3
TDF	20	6	16
Civil Engineering	10	3	11
Ground Rubber	13	2	11
Agricultural	5	0	3
Punch/Stamp	4	0	2
EAF	5	0	7
Landfill	15	2	7
Stockpiles	25	13	0

In tabulating the data provided by states, original, not calculated, values were used wherever possible. If a state provided data in "millions of tires," the original values are reflected in the "units" calculations and then converted to weights for the weights evaluation. Likewise, if a state reported in terms of weight, the original data are provided in the weights analysis and then converted for the "units" assessment. If a state provided data in terms of PTEs, the data were converted to weights or units using the PTE value used and provided by the reporting state.

Scrap Tire Generation Rates

RMA estimates that about 299 million tires were discarded in 2005, based on the data reported to RMA through the state survey process. Historically, RMA has compared new replacement tire shipments and scrapped vehicles data with U.S. population data. This comparison indicates that about one tire is discarded annually per person in the United States. This ratio has become an important estimation tool in scrap tire management.

For this report, RMA 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 3.

2005 RMA total industry replacement tire data were used. The 2005 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.

Furthermore, in its scrap tire questionnaire sent to the states, RMA for the first time asked states to report the number of scrap tires generated annually. The states reported a total of 299.15 million tires generated annually, which aligns 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 to represent annual generation and calculate recovery percentages.

Table 3: Scrap Tire Generation as a Function of U.S. Population (in 1000's)[1]

Passenger tire replacements[2]	**202,309**
Light truck tire replacements[2]	**35,025**
Medium, wide base, heavy truck replacement tires[2]	**17,784**
Tires from scrapped cars[3]	**25,912**
Tires from scrapped trucks and buses	**17,784**
Total scrapped tires	**299,595**
U.S. population – 2005 Census estimate (July 1, 2005)	**296,410**
Number of tires scrapped per person	**1.01**
Annual scrap tire generation, as reported by states	**299.15**

[1] All units represented in table are in 1000's, except for the number of tires per person, which is in actual units.

[2] 2005 RMA Tire Industry Facts, Factbook 2006. Industry total replacement tire shipments.

[3] Ward's Motor Vehicle Facts and Figures, 2006. Includes the number of vehicles removed from service in the car/light truck, truck and bus categories in 2005. Assumes 4 tires scrapped from light duty vehicles and 5 tires scrapped from trucks and buses.

Retreaded and Used Tires

In Europe and Japan, retreading and the used tire market are included in scrap tire market statistics. 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 United States, used tires and retreadable casings usually are handled through the same 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. In RMA's view, retreading is a viable technology that prolongs tire life and makes a positive contribution toward decreasing scrap tire disposal. RMA estimates that 16.255 million retreadable tire casings were retreaded in the U.S. in 2005 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. No extensive market data are available on the used tire market. 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, some U.S. used tires are exported from the U.S. and are counted as a scrap tire market because they leave the U.S.

Recycling and Scrap Tire Processing

RMA does not consider processing scrap tires to be the same as recycling scrap tires. While scrap tire processors serve an important role in the scrap tire management structure, RMA focuses on end-use markets.

In order for scrap tire processing to be considered "recycling," the product generated would have to be classified as "recycled" material. Without exception, state regulatory definitions for scrap tire programs consider scrap tire-derived material as a solid or special waste as long as it remains in the possession of a scrap tire processor. It is only upon the sale and transfer of the scrap tire-derived product that the material can be considered a non-waste or a commodity.

Processing scrap tires produces material for various scrap tire markets, including tire-derived fuel (TDF), ground rubber applications and civil engineering applications. Some end-uses in these market segments could be considered recycled products, while others, including TDF cannot. The use of TDF is considered a "recovery" (energy recovery) activity.

According to EPA, collecting and processing secondary materials is part of the "recycling process," not recycling. By conventional definition, a scrap tire "recycler" refers to a company that incorporates ground rubber into a new product, such as mats, molded or extruded rubber products, rubber modified asphalt and new tires. Interestingly, companies manufacturing such products typically focus on the performance attributes of their products, instead of the recycled content.

Other entrepreneurs sometimes attempt to enter the tire "recycling" business by producing a "product" with no market. An example of this situation is tire balers that define non-engineered structures (i.e., fences) as "recycling tires." RMA recognizes tire bales as a market application only when the structure has been certified by a professional engineer.

Another abuse of the term "recycler" occurs when a scrap tire processor amasses an excessive quantity of shredded scrap tires and calls that material "recyclable." This industry often has witnessed such processors go out of business, often abandoning whole or processed scrap tires in the process. This is why state regulatory definitions have made clear distinctions between processed tire material that is "recyclable" and material that is destined for a specified market.

How the scrap tire industry is defined can also have legislative implications. Several states enacted scrap tire legislation stating that "scrap tire recyclers" can receive payment directly from the state's scrap tire fund. If these payments are used to increase the demand for scrap tire-derived products, then the scrap tire program typically is successful. However, when this equates to paying scrap tire processors to simply process scrap tires (i.e. shred tires) with no identified end-use markets, the results are far different. History has taught us that using state scrap tire funds to subsidize scrap tire processing has yielded less than desirable results.

Scrap tire processing does serve an important and integral function in the recycling process. Production and sale of high quality scrap tire-derived materials is integral to the success of the industry. Yet processing scrap tires is not an end unto itself. The focus of this report, therefore, is on market development and progress. Only with healthy, stable and sustainable markets will the scrap tire management industry continue to thrive.

2

U.S. Scrap Tire Market Overview

From 2003 through the end of 2005, the total number of scrap tires going to a market annually increased from 233.3 million tires (80.4 percent of the 290.2 million generated) to 259.2 million (86.6 percent of the 299.15 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.

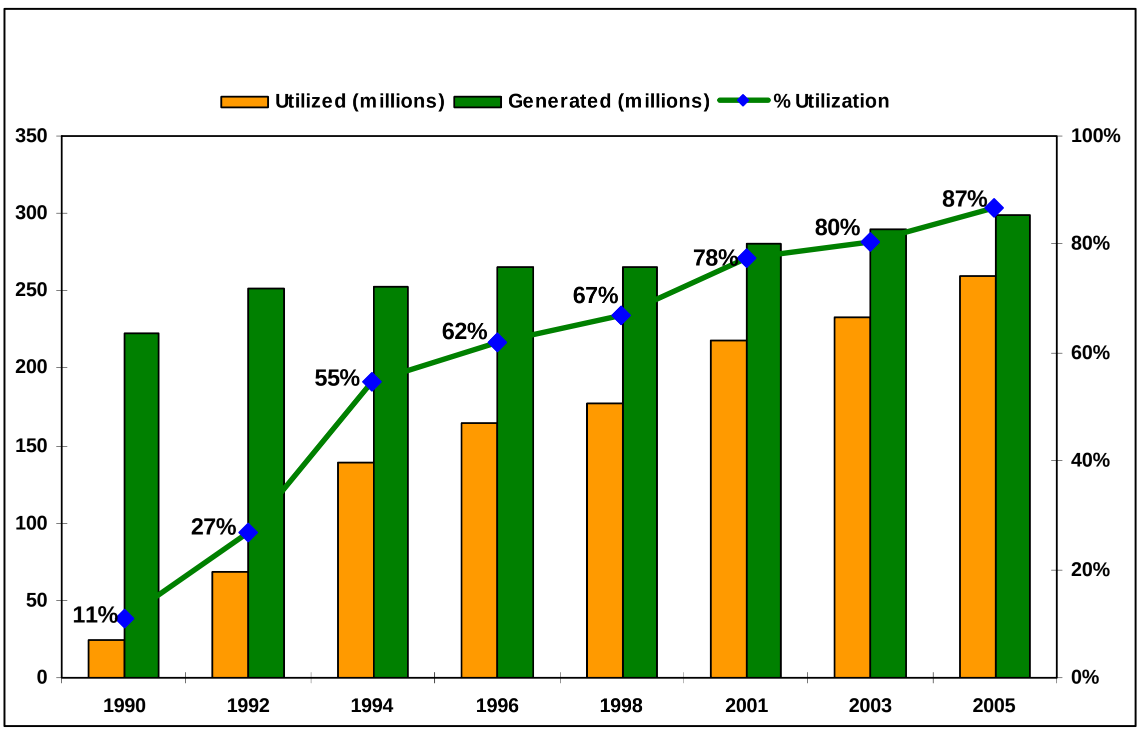

Figure 1: U.S. Scrap Tire Management Trends, 1990 - 2005.

In 2005, the market increases can be attributed to expanded markets for scrap tires for tire-derived fuel and coarse rubber applications. Table 4 shows the estimated total U.S. scrap tire market for 2005. In addition, the data collected for each state are presented in Appendix B, which cumulatively comprise the numbers presented in Table 4.

Figure 2 shows the disposition of scrap tires in the U.S. in 2005 and the relative percentages for each market or other disposition. 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 A.

Table 4: 2005 U.S. Scrap Tire Market Summary.

MARKET	***Millions of Tires***	***Tons x 10^3***
Tire-Derived Fuel (TDF)	155.09	2144.64
Civil Engineering	49.22	639.99
Ground Rubber	37.47	552.51
Export	6.87	111.99
Cut/Punched/Stamped	6.13	100.51
Miscellaneous/Agriculture	3.05	47.59
Electric Arc Furnaces	1.34	18.88
TOTAL USE	259.17	3616.11
TOTAL GENERATION	299.15	4410.73
Percent Utilization	***86.6***	***82.0***

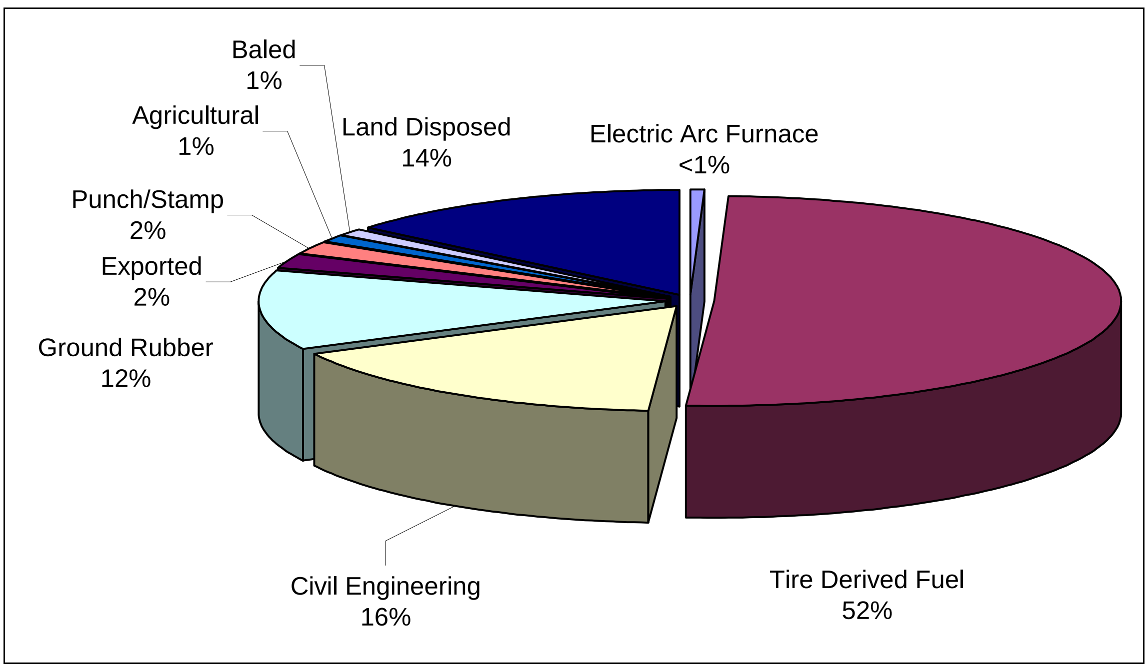

Figure 2: 2005 U.S. Scrap Tire Disposition (in millions of tires).

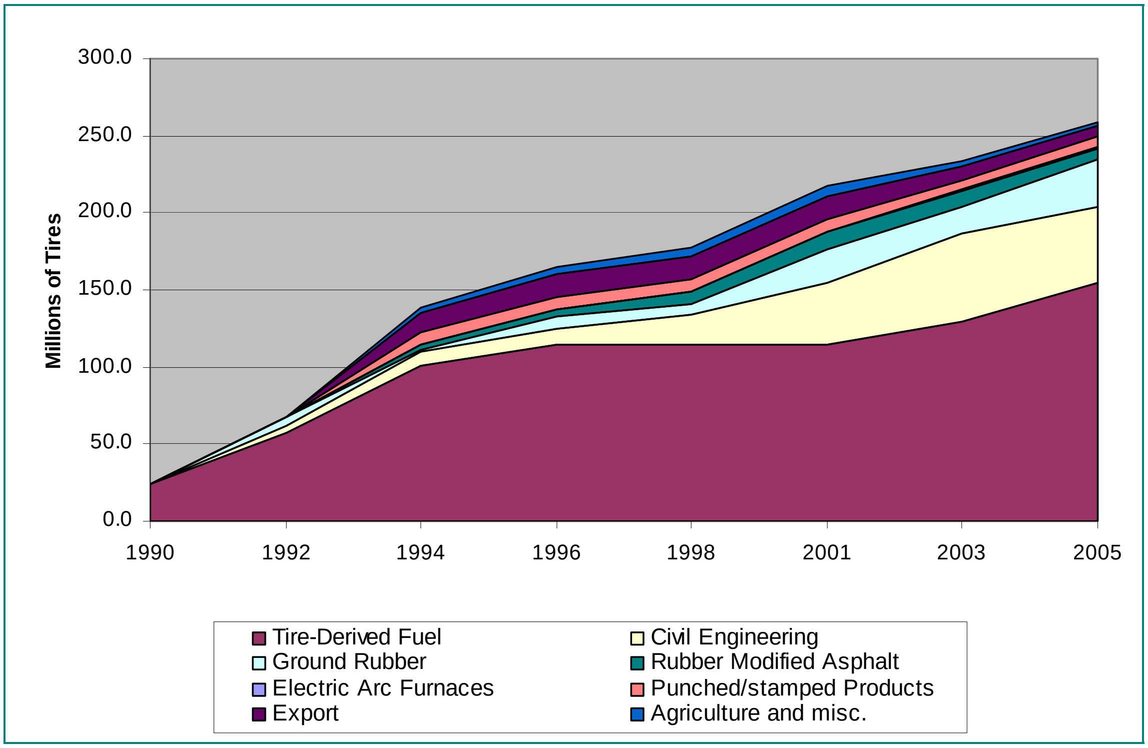

Figure 3: U.S. Scrap Tire Market Trends, 1990-2005.

As described in the previous chapter, RMA is publishing scrap tire market information data by weight for the first time. By weight, about 82 percent of scrap tires generated in the U.S. in 2005 were utilized by an end-use market. As expected, the recovery percentage by weight is lower than the recovery percentage by units (millions of tires), since tires range in size from small passenger tires to very large commercial applications. Since weight-based calculations are a new addition with this report, comparative and trend analyses are provided by units (millions of tires) only.

The tire-derived fuel market consumed 155.09 million tires (2144.64 thousand tons), up from 129 million tires in 2003. In the TDF market, the increase was a function of three factors: increased demand for alternative fuels due to elevated energy prices, continued improvement in the quality and consistency of TDF and more reliable delivery of a consistent TDF product.

The use of scrap tires in civil engineering declined since 2003. The 2005 data indicate that 49.22 million scrap tires (639.99 thousand tons) were used in a variety of applications, down from 55 million tires in 2003. 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.

Civil engineering market demand remains a function of three factors: cost competitiveness of tire shreds, compared to traditional construction materials, increased acceptance by regulatory agencies and increased recognition by scrap tire processors of market opportunities available in civil engineering applications.

The ground rubber market increased to 37.47 million tires (552.51 thousand tons), up from 28.2 million tires in 2003. In the ground rubber market there are two classes of particle sizes: “ground” rubber (10 mesh and smaller) and “coarse” rubber (4 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 2003 to 2005, 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.

Other markets include scrap tire exports, punched and stamped products and agricultural and miscellaneous uses. The export of tires was reported to involve about 6.5 million tires (111.99 thousand tons). Punched and stamped products were reported to use around 6.1 million tires (100.51 thousand tons). Agricultural and miscellaneous uses are estimated to be the same as has been reported in previous editions of this report, about 3 million tires (47.59 thousand tons).

3

Tire-Derived Fuel

At the end of 2005, 117 separate facilities were permitted to use tire-derived fuel (TDF).[1] Total annual TDF consumption was approximately 155 million scrap tires (2144.64 thousand tons). The permitted capacity of all facilities in 2005 was actually higher than the amount consumed, but several facilities permitted to use TDF actually did not use the maximum amount allowed or did not use TDF on a consistent basis. The level of TDF consumption in 2005 represents a 20 percent increase in the number of tires used as TDF since the end of 2003. Figure 4 shows the distribution of TDF usage across the various markets.

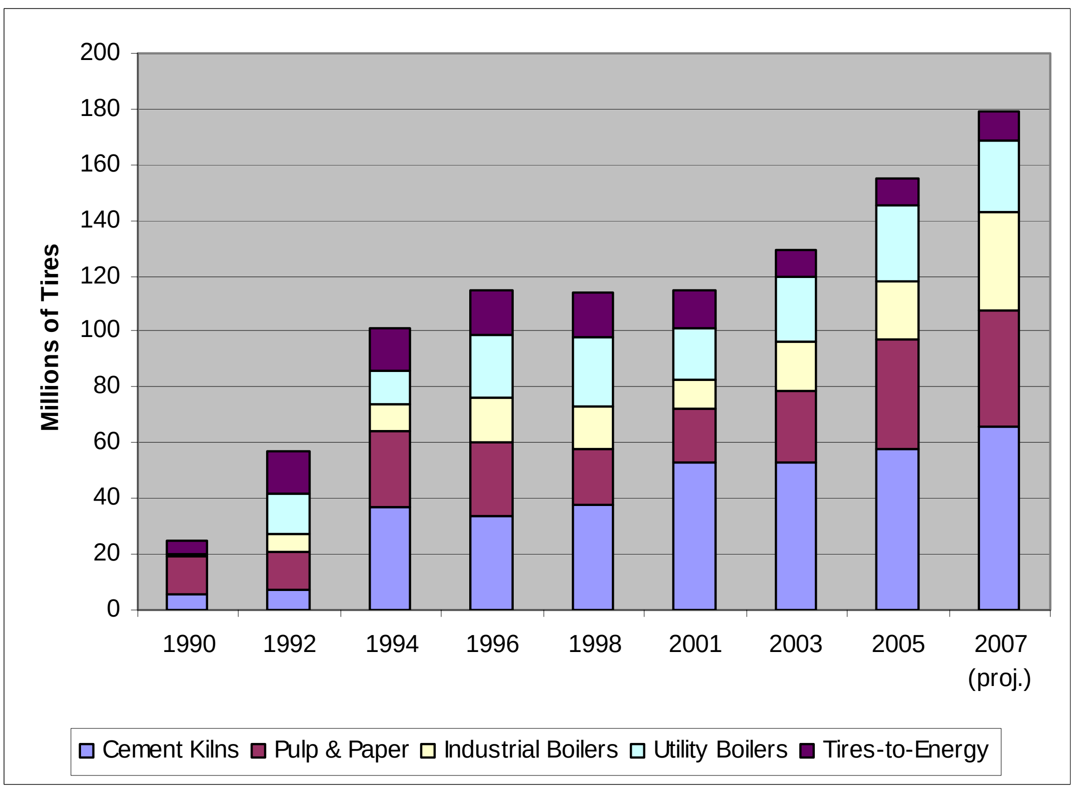

Figure 4: U.S. Tire-derived Fuel Market Distribution Trends, 1990 – 2007.

[1] The 117 total facilities using TDF in 2005 included 47 cement kilns, 24 pulp and paper mills, 22 electric utility boilers, 15 industrial boilers, six waste-to energy facilities, two lime kilns and one dedicated tires-to energy facility.

Overall, the industries that are taking the greater advantage of the benefits of TDF had to contend with a series of significant issues over the past two years. While this report will not go into detail about the changes that have occurred in the energy sector, suffice it to say that the cost of energy rose to new heights in the 2003 to 2005 timeframe.

Many large-scale energy consuming industries began or expanded use of alternative fuels, which had a direct and positive impact on the use of TDF. Another significant trend seen within the last two years is that several large-scale users of TDF have made considerable upgrades to TDF systems. This suggests TDF will continue to be used as an alternative fuel regardless of any changes in the cost of energy, thus implying that TDF usage will at least remain at its current level, if not increase to new record levels over the foreseeable future.

Prior to the discussion on the individual end use markets for TDF, a review of information supplied in the last edition of this report is appropriate. 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, does not appear to be economically viable at this time.

One of the major reasons for the improvement in the quality of TDF fuel chips has been the introduction of a new type of tire processing equipment. The processing system used in second stage scrap tire processing consists of slow speed machines designed to have a high steel removal efficiency (this equipment is known commercially as the Liberator, Grizzly or Rasper). The better the steel liberation at this point the easier it is for down stream processing of high-quality TDF or feed stock material for coarse or ground rubber production. Additionally, when steel is removed to make a TDF chip, the steel can be sold to metals processing and recycling operations.

In addition to producing a more refined fuel chip, this processing system has also yielded a secondary benefit: production of coarse rubber particles. It is commonplace that when using these large-scale, second stage scrap tire processing systems, the scrap tire processor also generates various percentages of smaller particle material. The particles generated range in size from one inch to three-eights of an inch. This is what is commonly referred to a "coarse" rubber, a larger form of ground rubber. The coarse rubber is generally separated by a screen as the finished product exits the processing system.

The generation and capture of this coarse rubber allows TDF producers to enter into the supply chain for this material, which is currently in relative high demand. This is a positive development, for it allows scrap tire processors who have historically focused on TDF production to develop a more diverse array of products that they can produce and sell. Since the generation of coarse rubber is a by-product of the generation of high quality TDF, the return on investment is enhanced and improves the economic stability of the scrap tire processors as well as increases the supply of this material.

The development of American Society for Testing and Materials (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.

The Cement Industry

At the end of 2005, 58 million tires (about 802.0 thousand tons) were consumed in the U.S. by a total of 17 cement companies using TDF in a total of 78 cement kilns in 47 cement facilities across the county (one location could have multiple kilns using scrap tires). Each cement company has several facilities located across the county. The total volume of tires consumed is reported here in tire units only, since the majority of scrap tires used in cement kilns as TDF is whole tires. Appendix C lists the cement kilns in the U.S. that utilize scrap tires as fuel.

The increase in TDF consumption by the cement industry once again is due to five main factors: (1) reduced demand for cement (since kilns with high demand for cement often do not use TDF because TDF use can limit kiln capacity), (2) elevated 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.

The data also indicate that a relatively high number of kilns are using relatively low volumes of TDF. This trend is due to a variety of factors. In the lower Atlantic Coast region and in the Gulf States area, the supply of whole tires for TDF was limited due to the demand for processed TDF by the pulp and paper industry.

The shift in the supply chain was due to the higher return on investment for processed TDF relative to the cost of supplying whole tires as fuel. In the Pacific Northwest, the supply of whole tires was limited due to the relatively high cost of transporting relatively low value whole tires the great distances between the sources of scrap tires (urban areas) and the kilns (usually some distance away in rural settings).

While some areas of the country had supply problems with whole tires, the Central and Plains states demonstrated a significant increase in the use of whole tires. Among Texas, Oklahoma and Kansas there were 12 cement kilns using whole tire TDF. In this area there were few other, large-scale, viable markets for scrap tires. Consequently, the combination of the locations of the cement kilns, the availability of whole tires and an efficient transportation system facilitated the rate of TDF usage.

As reported in previous editions of this report, environmental considerations continue to play a key role in the use of TDF in cement kilns. The EPA required 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 are also recipients of tires from stockpile abatement projects, which is a beneficial use of a material that would otherwise have few other market opportunities.

Pulp and Paper Mills

At the end of 2005 there were 24 pulp and paper mill boilers consuming 39 million scrap tires (539.3 thousand tons), up from 17 pulp and paper mill boilers consuming 26 million scrap tires at the end of 2003. 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 since TDF prices are a fraction the cost of traditional fuels, such as natural gas, coal, petroleum coke, etc. Appendix C lists the pulp and paper mills in the U.S. that utilized TDF in 2005.

As has been seen before, poor quality TDF will cause pulp and paper mill operators to stop use of this material, regardless of the price differential. Over the last four years, the quality of TDF has experienced significant and continuous improvement, which has contributed to the market growth. 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, TDF suppliers have installed TDF feeding systems for mill customers. This business arrangement has alleviated problems with capital outlays from the mills, which are often in short supply.

In the 2003 to 2005 timeframe, this market sector saw several former end-users resume use of TDF, while several other mills significantly increased use of TDF because of the continued high cost of energy. It appears now that even if there is a drop in the price of natural gas that TDF will continue to be used at present levels, since TDF will likely 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 volumes, is being diverted to the mulch market. This situation benefits the TDF market but presents marketing challenges for tire shreds being used in competitive applications, such as sports and playground coverings and other landscaping and soil amendment uses.

Electric Utilities

At the end of 2005, 17 electric utility boilers were using TDF on a regular basis, consuming the equivalent of 27 million scrap tires (373.3 thousand tons). Several of the market conditions that limited the use of TDF in this market sector in the past seemingly have been resolved. Electric utility deregulation, for many electric utility companies, has concluded. These companies are now seeking ways to remain competitive in the marketplace.

The purchase of relatively lower cost, high energy content alternative fuels is one way for these companies to remain competitive. Second, the production of high-quality, relatively steel free TDF is another major factor in the resurgence of this market. Appendix C lists the utility boilers in the U.S. that utilized TDF in 2005.

While TDF has made a comeback in this market, there still remain several technological limitations to the further expansion of this market. Many of the newer utility boilers either use pulverized coal or have entered into long-term contracts to purchase low-sulfur coal. 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. Also, 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 boiler operators will accept any fuel that contains more sulfur than contained in their current fuel.

Industrial Boilers

At the end of 2005, 16 industrial boilers were consuming an equivalent of 21 million scrap tire tires (290.4 thousand tons). Appendix C lists the industrial boilers in the U.S. that utilized TDF in 2005.

Over the past several years, the use of TDF has increased significantly in industrial boilers. The main reason for this is the increased use of TDF in circulating fluidized bed (CFB) boilers. According to the Department of Energy (DOE) website, CFB boilers "suspend solid fuels on upward-blowing jets of air during the combustion process. The result is a turbulent mixing of gas and solids. The tumbling action, much like a bubbling fluid, provides more effective chemical reactions and heat transfer" (***http://www.fossil.energy.gov/programs/powersystems/combustion/fluidizedbed_overview.html***).

The DOE website further explains that CFB "evolved from efforts to find a combustion process able to control pollutant emissions without external emission controls (such as scrubbers). The technology burns fuel at temperatures of 1,400 to 1,700 degrees F, well below the threshold where nitrogen oxides form (at approximately 2,500 degrees F, the nitrogen and oxygen atoms in the combustion air combine to form nitrogen oxide pollutants)."

The development of CFB boilers has led to greater fuel source flexibility for industrial boilers, since any solid fuels, including tires, can be combusted without additional emission control measures.

Dedicated Scrap Tires-to-Energy Facilities

At its peak in 1996 and 1998, three dedicated tires-to-energy facilities consumed some 16 million scrap tires annually in this market. At the end of

2005, there was only one dedicated tires-to-energy facility in operation consuming 10 million scrap tires (about 138.3 thousand tons). The cause for the decrease was due to the Illinois facility not being operational. At present the use of whole and/or processed tires in dedicated scrap tires-to-energy facilities remains limited to the one facility in Connecticut.

Three dedicated tires-to-energy facilities have been constructed in the United States: one each in California, Connecticut and Illinois. In California, the Modesto Energy Limited Partnership (MELP, Westly, 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.

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 in New York and Northern New Jersey.

Other TDF users

Lime Kilns

Lime kilns, like their cousins, cement kilns, can use tires as a source of heat in the lime production process. The production of lime in kilns does not require as long a combustion process as is needed in the manufacturing of cement. This has been a limiting factor for the use of TDF in lime kilns since the time needed to ensure complete combustion of the tire material is not available in all lime kilns.

Tires in commercial grade lime kilns have also been limited because the introduction of the tire could darken the color of the lime. While no negative impact on the lime's performance has been reported, there could be an impact on the acceptability of the color of the lime. The data collected indicates that tires are being used in two industrial lime kilns, where discoloration is not an issue.

The combination of elevated energy costs, abundant tire supply and compatible kilns has allowed for this market to be created. Still, the use of tires in lime kilns appears to be of limited scope, since less than a million tires are reportedly used in both lime kilns. The data collected indicates that there are an additional two lime kilns interested in using tires, which if realized, would probably double the current level of usage. This market likely can be helpful in a localized area near the lime kiln. The indications are that this market will not have any major impact on the overall scrap tire marketplace.

Resource Recovery Facilities

The term resource recovery facility (RRF) is used to describe a facility that combusts municipal solid waste. Another term frequently used is garbage (or waste)-to-energy facilities. There are some 110 RRFs in the United States. In 2005, six of these facilities reportedly used TDF. At some point virtually every one of these facilities has combusted some scrap tires. Still, the amounts consumed were generally small and previous versions of this report have never quantified the level used. When and where this market segment uses relatively larger-scale amounts of TDF it is primarily a function of the amount of solid waste the facility can acquire and consume.

In general, TDF use in RRFs represents only two to five percent of a facility's fuel supply. This typically translates into the consumption of less than 500,000 tires per facility per year. When tires are allowed into one of these facilities, the tipping fee and heating value from TDF provide a net benefit, as well as providing a combustible material needed to maintain their mass balance.

Three main reasons limit TDF use in RRFs. First, every RRF is designed to consume a certain amount of municipal solid waste (MSW). The economic viability of the RRF depends on taking in a certain quantity of MSW at a certain tipping fee. MSW contains about a third of the energy value of scrap tires (5,000 BTUs/lb versus 14,000 BTU/lb of tire). The RRF's mass balance is calculated based on a certain amount of MSW combusted that will yield a certain amount of energy. When tires are introduced into RRFs their heating value relative to their weight can cause combustion irregularities inside the RRF.

Second, using tires in a RRF can cause economic concerns since the tipping fee for tires is generally lower than the tipping fee for MSW. The third main reason is that the combustion technology in a RRF, particularly the grates upon which the MSW is combusted, are not designed for the greater heating value of tires. Placing concentrated energy sources like TDF into the combustion system has caused the grates to fail in the past.

Scrap tires are used in RRFs for two basic reasons: a lack of MSW or to off-set an even lower than normal heating value material. The lack of MSW available could be caused by an effective recycling program, shifts in population or more competitive MSW management options. A RRF often takes in very wet or very dry materials (grass clippings or dry leaves) and must use a higher BTU value material to maintain the facility's energy balance. Scrap tires can be a very effective material in such cases.

Since 1990, the RMA has not focused on RRFs as a potential TDF market for two basic reasons: an RRF would use a relatively low volume of TDF and a negative RRF experience with TDF could have caused an unneeded distraction from existing end use TDF markets. Therefore, no national effort to introduce TDF into RRFs exists.

Challenges to the TDF Marketplace

In 2005, three challenges to the TDF market emerged. Two of these threats are not specific to TDF, but if brought to fruition, could pose significant challenges to the TDF market. The third is a direct threat to TDF – a legal challenge by the state of Vermont to the use of TDF at an International Paper mill in New York State.

Review of EPA Air Rules

Recent petitions for review brought in the U.S. Court of Appeals D.C. Circuit challenge EPA's industrial, commercial and institutional boilers and process heaters Clean Air Act (CAA) section 112 standards and commercial and industrial solid waste incineration (CISWI) CAA section 129 MACT standards (Natural Resources Defense Council (NRDC), et. al, *petitioners* v. U.S. Environmental Protection Agency, *respondents* (04-1385 consolidated with 04-1386, 05-1302, 05-1434, 06-1065)). One of the key issues in the case is whether waste combusted for energy recovery should be regulated under section 112 or section 129 of the Clean Air Act.

The final CISWI rule distinguished between discarded material that is incinerated (which is subject to the more stringent requirements of Section 129 of the CAA) and material that is not discarded, but rather used as fuel (which remains subject to Section 112 of the CAA).

Thus, under the final rules, emissions associated with tires burned for energy recovery as tire-derived fuel are regulated under section 112 of the CAA.

However, if facilities using TDF for energy recovery were required to comply with section 129, this would impose additional regulatory and administrative burdens on such facilities and would serve as a significant disincentive to TDF use. Under such a scenario, even if a facility burned a small amount of TDF (even one tire), it might be subject to section 129, unless EPA explicitly recognized the fact that tires used as tire-derived fuel are not solid waste because they are not discarded or some other legally permissible justification.

This legal challenge is ongoing at this date. Environmental and municipal petitioners filed their briefs on June 12, 2006. Respondent's brief was filed on September 18, 2006. Other parties have also filed briefs, including state amici curiae and industry and environmental interveners. RMA filed an *amicus curiae* brief in the case to explain the policy implications if TDF burned for energy recovery were regulated under CAA section 129.

As of the writing of this report, the court had not ruled. Even if the court were to require EPA to revise its CISWI regulations, EPA would need to develop a factual record and make determinations such as whether tires used as fuel are solid wastes and whether using tires for energy recovery presented such a minimal impact that they should be exempted from the rule.

EPA would seek public comment on a proposed new rule and only issue the final rule after addressing these comments. If such a new rulemaking is initiated, RMA would continue to inform EPA about the legal, factual and policy reasons that tires are not solid wastes and that application of section 129 of the CAA to energy recovery facilities using tires is not necessary to protect the environment and would result in significant negative environmental impacts.

Biomass Tax Credits

The second challenge to the TDF market concerns the use of TDF in biomass combustion facilities. There was an opinion rendered by the Internal Revenue Service (IRS) on the use of non-biomass materials in biomass combustion facilities and the impact on tax credits that could be generated from the use of biomass materials.

Section 45 of the IRS Code allows taxpayers a credit for electricity produced from qualified energy resources, including any solid, non-hazardous, cellulose waste material or certain waste material that is segregated from other waste materials (this definition was expanded in the Energy Policy Act of 2005). Businesses that qualify for certain target federal income tax credits commonly broker them to other taxpayers that could better use them.

In early 2006 several "biomass" facilities were preparing to sell the Section 45 credits to other taxpayers and wanted to strengthen their tax position in the credits. Specifically, these facilities apparently create electricity from a mixture of qualified energy resources and a small amount of non-qualified energy resources. Tire-derived fuel is apparently a non-qualified energy resource.

These facilities requested a private letter ruling from the IRS to clarify how the combustion of non-qualifying fuels is treated in the calculation of the credit. Although a private letter ruling is generally only binding on the taxpayer who received the ruling, it does evidence the IRS' thinking on the matter. A "biomass" combustion facility that was using tire-derived fuel as a supplemental fuel may stop using TDF fuel if an unfavorable private letter ruling is issued for fear that they would lose the tax credits.

RMA submitted a White Paper to the IRS explaining the factual and legal background of the use of tire-derived fuel at biomass facilities. The White Paper sought to have the IRS address the issue by issuing a comprehensive IRS notice (instead of by private ruling), which would interpret Section 45 of the IRS Code as not prohibiting an otherwise qualified taxpayer from utilizing the tax credit for a biomass facility that also uses tire-derived fuel.

On September 26, 2006, the IRS released an interim guidance notice (2006-88) regarding the tax credit under section 45, pending issuance of a treasury regulation ("Interim Guidance"). The Interim Guidance states that "[e]lectricity produced from open-loop biomass [facilities] that is co-fired with fuels other than fossil fuels may qualify for the "45 credit."

Similarly, the Interim Guidance states that if "a taxpayer produces electricity from both open-loop biomass and other fuels" and "the open-loop biomass and other fuels are commingled during combustion and the steam and electricity is commingled," the percentage of electricity subject to the credit is the "percentage of the thermal content from open-loop biomass." One of the examples in the Interim Guidance is a paper mill that generates 25 percent of its thermal content using biomass and 75 percent using other fuels and states that 25 percent of the electricity qualifies for the tax credit.

RMA is going to verify that these references to "other than fossil fuels" and "other fuels" as allowing TDF to be used, since the term is not defined in the Interim Guidance. As of the writing of this report, RMA is in the process of evaluating the details of this proposal.

Positive EPA Statement on Tire-Derived Fuel

While these three examples pose new challenges to the TDF marketplace, positive developments have occurred as well. Most notably, EPA published a Tire-Derived Fuel Fact Sheet on its website. On March 7, 2005, the EPA posted its position statement on TDF onto their web site. This position statement was created through the EPA Resource Conservation Challenge subcommittee on TDF. To date this is the most definitive and positive statement the EPA has made on TDF. The EPA statement is as follows:

> EPA supports the highest and best practical use of scrap tires in accordance with the waste management hierarchy; in order of preference: reduce, reuse, recycle, waste-to-energy, and disposal in an appropriate facility. Disposal of scrap tires in tire piles is not an acceptable management practice because of the risks posed by tire fires, and because of the use of tire piles as a habitat by disease vectors such as mosquitoes. The use of scrap tires as tire derived fuel (TDF) is one of several viable alternatives to prevent newly generated scrap tires from inappropriate disposal in tire piles, and for reducing or eliminating existing tire stockpiles.
>
> . . .
>
> EPA testing has shown that TDF has a higher BTU value than coal. Based on over 15 years of experience with more than 80 individual facilities, EPA recognizes that the use of tire derived fuels is a viable alternative to the use of fossil fuels, and supports the responsible use of TDF in Portland cement kilns and other industrial facilities, provided the candidate facilities have developed a TDF storage and handling plan, and have secured a permit for all applicable State and Federal environmental programs and are in compliance with all requirements of this permit.
>
> – EPA TDF Website
> http://www.epa.gov/epaoswer/non-hw/muncpl/tires/tdf.htm

RMA applauds EPA for development and publication of this supportive and factual statement on TDF. EPA has the ability to encourage markets and eliminate barriers in ways that industry cannot. This statement is an important step in eliminating misperceptions about TDF. RMA encourages continued EPA leadership in this area.

Table 5: TDF Market Trends and 2007 Projections.

	1990	1992	1994	1996	1998	2001	2003	2005	2007 (proj.)
Cement Kilns	6	7	37	34	38	53	53	58	66
Pulp & Paper	13	14	27	26	20	19	26	39	42
Industrial Boilers		6	10	16	15	11	17	21	35
Utility Boilers	1	15	12	23	25	18	23.7	27	26
Tires-to-Energy	4.5	15	15	16	16	14	10	10	10
Total Fuel	24.5	57	101	115	114	115	129.7	155.1	179

Market Outlook

The outlook for the TDF market remains optimistic over the next two years. However, the various market segments will face different market challenges and opportunities. Every indication exists that TDF markets will remain strong for the foreseeable future, barring any legal or regulatory disruptions. In fact, TDF use could increase over the next two years. RMA projects a 10 to 20 percent increase over current usage levels. Table 5 shows the historical TDF trends and projected market expansion for 2007.

Limited potential TDF market capacity exists in some regional markets, due to scrap tire supply constraints. Several markets are rapidly approaching these limits. In the cement industry there appear to be only another six to ten cement kilns that could readily use TDF. In the pulp and paper industry, RMA estimates that five to ten additional mills could use TDF. Additionally, about five utility boilers and no other dedicated scrap tire-to-energy facilities could potentially use TDF. The industrial boiler market has a greater expansion potential, although this realizing this potential is dependent on cultivation of new TDF users.

An apt summary of this analysis is that in the near term, the scrap tire marketplace could be characterized by a base TDF market of some 200 million tires. The other markets combined would consume the remaining tires (estimated at 150 million). This analysis can give states the time necessary to work with the scrap tire industry and develop the other markets that will be needed to accommodate the scrap tires generated annually.

Cement Industry

In order for the kilns using relatively low quantities of TDF to increase TDF use, greater supply must be made available in the marketplace. Supply issues notwithstanding, cement kilns may be limited in the amount of TDF they can use due to limited amount of additional oxygen that can be introduced into the kiln. The use of whole tires in cement kilns typically causes a need to introduce extra oxygen into the cement making process. Not all kilns have excess capacity for oxygen or the ability to increase this capacity. Furthermore, due to the manner in which any given kiln is configured, the quantity of tires that can be introduced at any point in the cement making process may be limited.

In addition, cement kilns typically do not operate non-stop year around due to annual or semi-annual maintenance, during which time scrap tires are not consumed. In the past two years several cement kilns were shut down for major renovations. All of these factors combine to disrupt the constant flow of scrap tires to cement kilns.

Overall, the data collected suggest that the use of scrap tires in cement kilns will continue to be the major end-use market. Maximum capacity may be reached in several years in the cement kilns in the U.S. that have the ability to use TDF. This will clearly have an impact on the marketplace, because the cement industry has been a major contributor the steady increase in the number of tires consumed as TDF.

Pulp and Paper Industry

The pulp and paper mill industry is concentrated in three geographic regions of the country: the Northeast, Southeast and Northwest. At present, the use of TDF in pulp and paper mills is common in the Northeast (Maine) and the Southeast. The mills in the Northwest, which were the first to use TDF, are not currently TDF users. The number of end users in the Northeast is limited but stable. At this time, one other mill could use TDF.

The situation in the Southeast (North Carolina to Louisiana) is such that there might be more demand for TDF than the supply chain can provide. Consequently, the unique situation in this region is that the growth of this market will be limited because of the already elevated level of demand for TDF and consequent lack of supply. What this suggests is that the current level of TDF use should be sustained, because any excess supply would be shifted to either a new end user or to satisfy increased demand from an existing end user.

The situation in the Northwest differs dramatically. Here, the relatively abundant supply of low cost petroleum coke has had a negative impact on the use of TDF. At present, no Northwest pulp and paper mills use TDF. This situation likely will not change for the foreseeable future.

Utility Boilers

As many as 10 utility boilers may be considering the use of TDF. Growth potential in this market appears to be modest. RMA projects that only two or three utilities actually will begin using TDF over the next two years.

There are several reasons for this conservative forecast. Several of the utilities are located in the North Central region of the country, where tire supply is limited. Even with the possibility of transporting large quantities of TDF via barge or train, the relatively high demand for TDF in cement kilns in the central portion of the country and demand for TDF in the Southeast likely places limits on the potential supply of scrap tires. Several of the utilities are in states that already have a strong TDF market. The combination of long-term contracts and limited supply is likely to stymie these potential end users. This is not to suggest that fuel managers at these utility boilers could not increase the price they would be willing to pay for high quality TDF. The market would probably respond favorably to such a shift in pricing policy.

Industrial Boilers

RMA anticipates a substantial increase in this market niche. The data collected suggest that as many as 10 industrial boilers are interested in TDF as a source of fuel. Analysis shows that at least five additional industrial boilers could begin using TDF over the course of the next two years. This could increase the amount of TDF consumed by 7 to 10 million tires. The other facilities appear to be limited due to the same factors as mentioned in the utility boiler section – location and supply of TDF.

Dedicated Tires-To-Energy Facilities

There has been some recent activity with the dedicated tire-to-energy facility in Illinois, suggesting that this facility could begin combusting tires again. At the end of 2005, this facility still was not operational. Currently, there is no indication that this facility will be operating in the short-term. It is possible that this facility could become active some time over the next two years. If that would occur, then clearly the number of scrap tires used in these types of facilities would increase dramatically. However, outside of this one potential end user there does not appear to be any realistic likelihood that another dedicated tire-to-energy facility will be built. In contrast, there is no indication that the Sterling, Connecticut facility will cease operations in the near term.

Other TDF Markets

The majority of RRFs reporting relatively larger-scale use of TDF are located in Florida, with most of the RRFs that reported an interest in using TDF also being in Florida. Consequently, this is more of a local market rather than a new national trend. As such, it does not appear reasonable to consider the use of TDF in RRF as a major growth area for the foreseeable future.

4

Civil Engineering Applications

In 2005, approximately 49 million scrap tires were used in civil engineering applications (639.99 thousand tons). This is a reduction of six million scrap tires, or a nearly six percent decrease, since 2003.

Since 1992, when the first civil engineering applications were introduced to the marketplace, the number of available applications has increased dramatically. In addition, the quality of the shred used in these applications has increased as well. Over time, tires shreds have turned into a commodity and are now commonly referred to as tire-derived aggregate, or TDA.

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 TDA, with a range of two to 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 6 lists the properties of tire rubber used in civil engineering applications.

Table 6: Properties of TDA 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***

Over the course of the last two years changes in the market have had a profound impact on TDA use. The use of TDA still provides both an engineering and cost benefit. However, the use of TDA historically has been most prevalent in the Mid-Atlantic to Southeastern regions of the country, the same regions that have the highest concentration of TDF users in the country.

The overall economic conditions of the marketplace have drawn a significant amount of the annual scrap tire supply from the TDA market to the TDF market. The main reason for this shift is that the return on investment for high-quality TDF is greater than that for TDA. Consequently, the increased use of TDF in the Southeast and Atlantic

Coast region has limited the volume of scrap tires available to the TDA market.

The market substitution of TDF for TDA is not the only reason for this decrease. The use of TDA as a drainage medium in landfill leachate liners has decreased due to some reported problems of clogging. It have been reported that TDA traps too many solids in the drainage layer, which decreases the ability of the leachate to flow freely. Consequently, this market niche declined across the nation, not just in the Atlantic Coast/Southeastern portion of the county.

Civil engineering applications continue to lack wide acceptance by a number of states. This lack of acceptance falls into one of two categories: institutional obstacles or policy preferences. Institutional obstacles are generally permitting conditions or regulatory definitions that make the use of TDA very difficult or impossible.

Often, different state agencies or different departments within a single agency have conflicting regulations. Sometimes scrap tires are considered a solid or special waste, even after they are processed and sold as an aggregate. In this case, potential end-user would have to obtain a solid waste storage permit in order to store TDA for a civil engineering project. Since competing aggregate materials do not require this additional permitting step, other materials are often selected instead of TDA.

Another form of institutional obstacle is in the permitting process when a regulatory agency requires development of its own testing protocol for applications that have been used elsewhere. The duplication of testing procedures not only adds cost to the price of TDA, but delays the approval process, sometimes by months or years.

Policy preference, the other category of obstacle to civil engineering applications, occurs when a decision maker in a regulatory agency, is biased against such applications. Policy preference information was not directly obtained from the state agency questionnaire, yet is readily observable in the field.

States that encourage the use of TDA make the permitting process straight forward. States that disfavor TDA make the permitting process so difficult that the marketplace is stymied. The irony of this situation is that most of the states that are not allowing the use of tire shreds as TDA are also among the states with the fewest overall markets for scrap tires.

One of the goals for the Civil Engineering subgroup of the EPA Resource Conversation Challenge is to identify the states that have institutional obstacles and address them. This is accomplished by providing the necessary technical materials, identifying competing regulations that cause the obstacles and working with the state agencies to reach an understanding that will remove these barriers.

Landfill Construction and Operation

Overall, there are five applications for tire-derived aggregate (TDA) in landfill construction. These applications are for the use of TDA as a drainage layer in cap closures, as permeable backfill in gas venting systems, as a material for daily cover, permeable aggregate for leachate collection systems and in operational layers. It must be noted that the use of scrap tires in landfill construction must not be considered as a disposal option. Rather, it is a beneficial use of the properties of processed scrap tires. TDA replaces other construction materials that would have had to be purchased.

Cap Closures

TDA is being used in lieu of drainage aggregate in the final cover system for landfills. In this application the TDA is typically placed as a one-foot thick layer between the impervious cap and the vegetative support layer. The TDA size used for this application varies, but often is 3-in. maximum size material.

Gas Venting Systems

A 3 to 4 inch maximum size, cleanly cut shred is used as the bedding material for gas extraction pipes. The lightweight nature of TDA, relative to conventional drainage aggregate, allows the TDA to settle with the surrounding trash thereby exerting less pressure against the gas venting equipment. This reduces shifting or damage to the gas venting pipes.

Alternate Daily Cover

Rough shreds are mixed with clean fill (dirt) to comprise the six inches of cover material every landfill 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-scale amounts of abatement tires, as well as residual tire material from TDF processing. This application is proving beneficial for landfills with limited access to clean fill. In this application, TDA proves effective in keeping the municipal waste in the landfill and restricting birds or rodents from entering the landfill. TDA used alone has no ability to control odor emanating from the landfill or infiltration of precipitation. Consequently, landfill operators are combining dirt with tires in a 50-50 mixture.

Leachate Collection Systems

Leachate collection systems have been the most widely used applications for TDA in landfills. In this application, a relatively clean-cut 3 to 4-inch square shred replaces the upper foot of the two to three feet of sand that is required in a leachate collection system. TDA is not used in the sections of the collection system that touch the geomembrane that lines the bottom of the landfill due to concerns that tire wire would puncture the geomembrane and cause leakage.

Operational Layers

Operational layers separate municipal solid waste from the leachate collection and removal system (LCRS). LCRS are typically comprised of one or more drainage layers and impervious barriers such as a geosynthetic membrane, geosynthetic clay liner or compacted clay liner. TDA is used in lieu of conventional material (sand, clean fill, or select waste), but is not typically placed directly against the geomembrane liner.

Septic System Drain Fields

TDA is used in several states to construct drain fields for septic systems. The lower density of TDA greatly reduces the expense and the labor to construct drain fields, while the material provides equal performance to the traditional stone backfill material. Arkansas, Florida, Georgia, South Carolina, Virginia and many other states allow this application.

TDA is fast becoming accepted by the septic field construction industry for several reasons. First, TDA has a greater void space percentage compared to stone. For the low vertical pressures involved with this application, TDA contains 62 percent void space, as compared to 44 percent with stone. This allows TDA to hold more water than stone. Second, TDA is lighter than stone, which makes moving the material easier than moving stone during construction. Third, the increasing acceptance of TDA is also a function of improved quality. The pieces must be clean cut and have uniform size.

While TDA has clearly demonstrated that it can be used in these applications, further expansion will depend on the level of acceptance by appropriate government agencies and on economics. Where and when TDA is less expensive than stone and where state regulations do not restrict this application, it is expected that this market niche will expand.

Subgrade Fill and Embankments

California, Colorado, Maine, Massachusetts, Minnesota, New York, North Carolina, Oregon, Pennsylvania, Texas, Vermont, Virginia, Wisconsin and Wyoming have used TDA as a subgrade fill in the construction of highway embankments and other fill projects. The principal engineering advantage that TDA brings to these projects is lighter weight (one-third to one-half of conventional soil fill).

Use of TDA allows construction of embankments on weak, compressible foundation soils. For most projects, the use of TDA as a lightweight fill material is significantly cheaper than alternatives, such as use of expanded shale aggregate or polystyrene insulation blocks.

Projects featuring TDA use include:

- Construction of a highway embankment in the Alleghany River Valley northeast of Pittsburgh, Pennsylvania;
- Building a highway on-ramp on compressible San Francisco Bay Mud north of San Jose, California;
- 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;
- Highway embankment stabilization in Topsham, Maine; and
- Reconstruction of a highway shoulder in a slide prone area in Oregon.

TDA also has been used to retain forest roads, protect coastal roads from erosion, enhance the stability of steep slopes along highways and reinforce shoulder areas.

Backfill for Walls and Bridge Abutments

Several projects have been constructed using TDA as backfill for walls and bridge abutments. The weight of the TDA produces lower horizontal pressure on the wall, allowing for construction of walls with less reinforcing steel. In addition, TDA is free draining and provides 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 wall projects have been constructed in Pennsylvania and California. Research conducted in Maine and South Dakota also shows that the compressibility provided by a thin layer of TDA placed directly against a bridge abutment can significantly reduce horizontal pressures.

TDA can also be used in small-scale, homeowner-level civil engineering applications. TDA has been used in some areas as a drainage medium around house foundations.

Subgrade Insulation for Roads

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

Vibration Dampening Layers

TDA has been used to attenuate ground born vibrations generated by light-rail passenger car lines. This application absorbs vibrations from trains that travel through the ground and reemerge as noise in adjacent homes and businesses. A 12-inch thick layer of three inch maximum size TDA beneath the stone ballast is used to absorb the vibration. This technology was recently used on a half mile of track in San Jose, California. It will also be used on upcoming expansions of the light rail system in Denver, Colorado. This technology is generally a fraction of the cost of alternate methods to reduce ground born vibrations.

Baled Tires

The technology to “bale” scrap tires has been on the market since 1988. Tire baling is a process where up to 100 scrap tires are placed onto a rod where they are then compressed into a condensed block. The tire bale is then secured with some form of ties, typically metal or plastic. There appear to be two primary baling technologies that form somewhat differently shaped bales. In either case, the bale weighs between 888 to 2,000 pounds. Baling is not in itself a recycling activity. Instead, it is another form of tire processing. Bales are neither advantageous nor disadvantageous to the marketplace. Rather, the potential benefit of tire bales is a function of where and how they are used.

There have been several successful applications of tire bales. Most notable of these applications has been as a construction material, used as a side-slope stabilizer. This has been used once in Arizona and several times in Texas. Tire bales have also been used successfully as a road base in New York. In each of these cases the use of tire bales were incorporated into a project that was designed and managed by a professional engineer.

There have also been a series of applications where the use of tire bales has not been successful. Tire bales were used as a base for cattle feed lots, wind breaks at cattle feed lots and in erosion control along river banks. In these applications, the structural integrity of the bale failed, causing the need to have the baled tires removed. There have been numerous attempts to use baled tires in a variety of applications (i.e., as a fence, as a background material for shooting ranges, etc), but these applications have not been well received by the state regulatory community.

The distinguishing factor between a successful and unsuccessful application for baled tires is the level of engineering that goes into the project. Those projects that are designed and receive the stamp of approval by a professional engineer have yet to fail. Consequently the recommend manner in which to use baled tires is in engineered projects.

In 2005, some 2,657,500 scrap tires were baled, primarily in four states (Arkansas, Montana, Texas and New Mexico). It should be noted that many of the baled tires have not been sent to the market but rather have been baled and remain on the processors premises.

Market Outlook

RMA projects that demand for TDA in the Atlantic Coast and Southeast regions of the country will remain stable. Competition for scrap tires between the TDF and TDA markets will probably continue in the Southeast. It also appears that the states which are now just beginning to permit and encourage civil engineering markets are not achieving the increased levels of usage they envisioned. Finally, it also appears that the EPA RCC market development effort will need at least several years to become effective. The result of these factors suggests that there will probably not be a dramatic resurgence in TDA usage over the course of the next two years.

Also, a limited number of other states continue to develop these markets. Overall, RMA projects that TDA use will increase by 10 to 20 percent (four to eight million tires) over the next two years.

Of concern is that 75 percent of all civil engineering use is concentrated in eight states (Texas, North Carolina, Virginia, Iowa, Minnesota, Ohio, South Carolina and Maine). The use of scrap tires in civil engineering applications is expected to continue at current levels in Texas, North Carolina, Maine and Minnesota. In Iowa, Ohio and Virginia, however, the markets are primarily driven by abatement programs. Once these abatement programs are completed, it is unclear whether these markets will continue.

5

Ground Rubber Applications

In 2005, about 37.47 million scrap tires were consumed by ground rubber applications (552.51 thousand tons). This market experienced growth since 2003, when 28.2 million tires were used by this market. In this market, whole scrap tires are processed, removing the wire and textile to create ground rubber specified by the various market applications described below.

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 2005, as in previous years, 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 by the end of 2005, approximately 730 million pounds of processed ground rubber was sold into an array of market applications. Of that total, about 480 million pounds was generated from whole scrap tires, while 250 million pounds of ground rubber was generated from tire buffings.

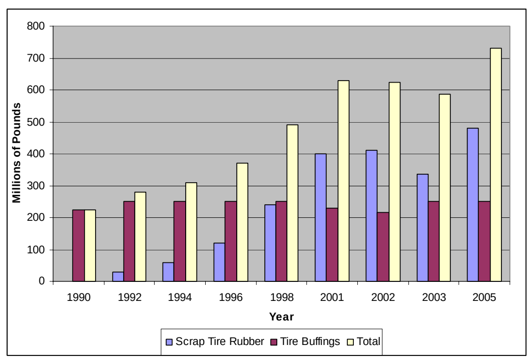

Figure 5: U.S. Ground Rubber Supply, 1990 – 2005.

While the term "ground rubber" (also known as "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 to 80 mesh
- Fine Grind Rubber: 80 to 400 mesh

There are several distinct markets for ground 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 2005 among these various markets.

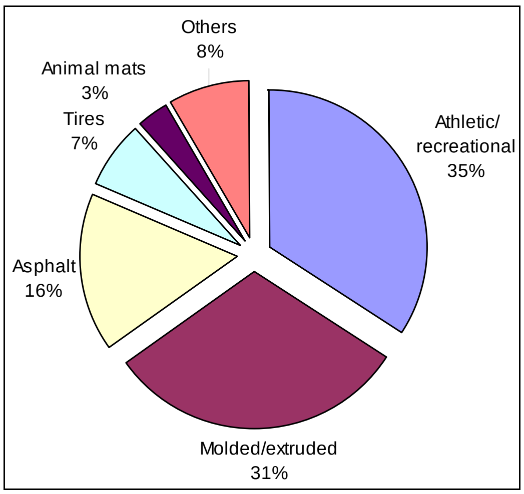

Figure 6: U.S. Ground Rubber Market Distribution, 2005.

The data collected show some interesting patterns and trends. Overall, the amount of ground rubber going into the asphalt market was the same as 2003. The same is true for ground rubber going into new tire construction and animal bedding products. There was a modest increase in the amount of ground rubber in molded and extruded rubber products. The major increases for the ground rubber market were in athletic field applications and "other" markets. The amount of ground rubber going to sports field applications increased by 67 percent and the sum total increase for the "other" category nearly doubled.

The data indicate that the major products in the "other" category include horticultural products (mulch, weed control devices), horse arena cover and products that we could not clearly identify from the data received.

The very significant increase in sports surfacing applications comes from the growth of the use of ground rubber in synthetic field turf applications for football, soccer and other related sports playing surfaces. Industry sources indicate that ground rubber based sport surfacing systems were placed in 600 to 800 sports fields in the United States in 2005. In 2006, RMA anticipates that another 1200 sport fields could convert to ground rubber-based systems from traditional aggregate or turf systems. Consequently, the short-term outlook for this market niche is very good. The same can be stated for the horticultural market niche.

An analysis of these markets has led us to the following conclusion: there is a cycle to demand and sustainability of ground rubber products. It appears the cycle has seven phases: introduction, incubation, acceptance, increased demand, market saturation, gradual decrease and stasis. For this discussion, playground cover serves as the example.

The use of scrap tires as a playground cover material was first introduced some six or seven years ago. It took about two years for this concept to become accepted in the marketplace. Once the safety features were recognized, the demand for scrap tire-derived playground cover increased dramatically. From 2002 through 2004 this was one of the major markets for ground rubber. However, a finite number of playgrounds exist. Many of those consumers that would purchase ground rubber playground material did so during that period. Since 2004 the amount of ground rubber going into this market niche has been decreasing.

Several factors caused this slow down in market demand. First, the market is saturated. Second, several state grant programs for the purchase of playground material have ended. These grants did not stimulate the demand for this product, since it has been reported that there has not been any after-grant purchases by former state grant recipients. Third, many school systems, one of the major target markets for this product, are still having budgetary problems that limit the purchase of this product. Consequently, the demand for playground cover products is decreasing from the sales numbers of just a few years ago. This is not to suggest that this market will disappear. Instead, the level of demand for ground rubber playground products will level off at some lower point, probably followed by a gradual decline in nationwide sales over the next five years.

The implications of these observations are meaningful and suggest that the current strong demand for horticultural products and sport surfacing applications are unlikely to be sustained for more than another two-to-three year period. It further indicates that the level of demand for ground rubber going into animal bedding products and new tires have probably reached their levels of stasis.

Ground rubber producers should be seeking and developing the next target market and can not count on the current level of demand being sustained for all products. The asphalt and molded products ground rubber markets may be susceptible to this market cycle as well. However, there are several factors that could allow these market applications to continue to expand. These factors will be discussed in the market outlook section.

Since 2003, the distribution of ground rubber producing capacity has shifted. Historically, 90 percent of the ground rubber volume was produced by 10 percent of the U.S. ground rubber producing companies. Today, of the some 60 companies producing ground rubber in the United States, an estimated 15 companies (25 percent of the total number of companies), produce 90 percent of the ground rubber entering the market.

The major ground rubber producers share several important attributes: consistent, high quality product; competitive pricing and a loyal customer base that values quality product in addition to competitive pricing in geographic areas where markets are stable. While a considerable improvement compared to just a few years ago, some companies have not yet reached this level and are struggling to achieve market success.

Yet, some marketing tactics of struggling companies can be detrimental to the industry. Sometimes fledgling ground rubber producers will attempt to boost sales by reducing the price of their product. This is not a new approach for this sector. Since 1992, some ground rubber producers with excess inventory have tried this tactic. Seven consequences to this sales strategy typically follow: (1) the market for that specific size of ground rubber becomes flooded with product and prices fall; (2) the company that is selling this under-valued product quickly begins to experience additional financial losses and the quality of this material decreases; (3) companies that have to match these below-fair market prices to maintain customers also start to experience financial losses; (4) the company that began this "fire-sale" marketing approach goes out of business, reducing the quantity of that specific sized rubber available on the market; (5) the price for that particular sized rubber does not return to the pre-dumping prices; (6) major suppliers of that particular sized product experience reduced earnings which poses financial strain; and (7) fair market values are skewed downward resulting in purchasers demanding price points that are unsustainable often resulting in disrupted or discontinued use of crumb rubber which retards growth and development of new uses for crumb rubber.

In spite of the existence of detrimental marketing tactics, since 2002 the ground rubber producing sector of the scrap tire industry has become more stable. A greater percentage of ground rubber producers are selling a relatively greater percentage of the material sold. The market has seen lower turnover in this segment of the industry, with a greater incidence of owner turnover or plant closings in lower volume ground rubber producers. While this should be expected as a function of the marketplace, it is difficult to balance production capacity and market demand because of the presence of recent entrants into the ground rubber production arena.

This is not to suggest that every new company that begins to produce ground rubber will eventually flood the market with product and ultimately go out of business. This is to suggest that if a new entrant to the ground rubber marketplace does not have a well developed business plan that focuses on untapped markets or cannot expand sales into an already crowded marketplace, then they should have a limited expectation of success. History shows that the majority of failed crumb rubber producers enter the market place without a clear business plan or reliable customer base. This, coupled with poor due diligence by investors and exaggeration of the need for additional capacity or tire disposal, results in a continual revolving door of new entrants and those who exit the ground rubber processing field.

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, artificial turf infill, for playground surfaces and as a turf top dressing.

The incorporation of rubber into sport surfaces provides two benefits: increased safety and 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.

Artificial Turf Applications

Artificial turf applications are and will continue to be the major market niche in the ground rubber market. In artificial turf applications, artificial grass is embedded in a mixture of ground rubber and sand. These applications are used in football and soccer fields and have gained wide recognition as a system that allows for better drainage of water and reduces injuries to the athletes. 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.

Industry sources report that these rubber-based sports field systems were installed in over 600 fields in 2005. RMA projects that in 2006 and 2007 this market could double and maintain that level through 2008. Secondary sales could become a major positive factor over the next six to eight years.

Playground Cover

Overall, the ground rubber playground market, typically loose fill, has been slowed by several factors. This market has relied on state grants to fund playground projects. These grants have not stimulated the market. Instead, they have created a cycle where schools receive a grant, spend it and then wait for the next grant. Reduced school budgets further inhibit the marketplace because schools cannot afford to refurbish a playground absent a state grant. Often, playground equipment manufacturers and contractors sell schools lower cost materials rather than emphasizing the lower long term costs associated with rubber playground material and the child safety benefits associated with it. Interestingly, it is in a contractor's interest to continue selling lower cost materials on a consistent basis instead of selling longer lasting rubber playground materials, where repeat business will have a longer cycle.

Data received from industry sources indicate that a shift has occurred in the sales patterns in this market niche. There appears to be less demand for large-scale loose-fill rubber and increased demand for the pour-in-place systems. Practitioners are also experiencing increased sales of smaller sized loose-fill material (50 pound bags) in the residential (retail) markets. This data suggests that schools and other institutions are not buying loose-fill materials, probably for the reasons cited earlier. The upward trend in the relatively more expensive pour-in-place rubber systems suggest the consumer base for playground cover has shifted.

The original target markets for this product were public schools and institutions. Now the consumer base is moving toward the private institutions (schools, malls) that are looking to install a safe and durable product in play areas. There is no consensus on whether this sales trend will continue or how large a potential market this can be.

The relatively significant demand in retail sales of smaller sized quantities of loose tire playground cover suggests that there is considerable interest from home owners with on-site playground equipment. Once again, there is no consensus from the industry sources contacted as to the exact size or potential of this market. Yet it is reasonable to assume that there could be a large, untapped market potential for home use of loose-fill playground material.

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 also 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.

The demand for ground rubber for molded and extruded products is concentrated in three geographic regions: the Southeast, Northwest and Central portions of the country, where the established product manufacturers are located. Expansion in this market was due to increased production capacity at established facilities, rather than new businesses entering the market.

Aside from the sport surfacing market, RMA believes that the molded and extruded rubber products market (mats, blocks, sheets of rubber) has the greatest potential to expand. The products manufactured typically are high-quality and relatively competitively priced. However, several factors are limiting this market growth.

Overall, a lack of knowledge exists on the methods to compound (blend together) recycled rubber with polymers. Also, there is a lack of publicly available information on compounding recycled rubber and success stories of companies and products in this arena.

The rubber manufacturing industry is both limited and concentrated in three general geographic regions, which in turn concentrates expertise. Consequently, even if there is a dramatic increase in the amount of ground rubber used in molded products, it would not represent a nationwide market opportunity. A significant limit to this market expansion is the fact that not all polymers are compatible, so there could be several families of recycled materials that would not be used in these applications.

As in other industrial sectors, foreign competition in the molded and extruded products market is forcing companies to move production off shore. If this trend continues, the molded and extruded rubber market could disappear from the ground rubber market. This could significantly affect the overall well-being of the ground rubber market and would likely cause several major ground rubber producers to cease operation.

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, but also in other states.

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 is not expected to increase immediately.

The outlook for the sale of ground rubber in the rubber modified asphalt market (or rubber asphalt concrete or RAC) is not particularly positive. From the data collected, RMA anticipates that the five states which are already using RAC (California, Arizona, Texas, Florida and South Carolina) will continue to do. Among these states, Florida has reduced the amount of RAC used by some 20 percent, while California and South Carolina still use grants to entice counties and municipalities to use this material.

There are several states and one city (Nevada, Rhode Island, Washington, Missouri and Chicago) that appear to be interested in using RAC. In Chicago, the City Council passed a mandate for the use of RAC; historically mandates have not had the long-term impact they intended. Two states that have put down test patches of RAC (Nebraska and Tennessee) and appear to be content to wait until a complete assessment on the performance of those roads is available. Several states considered RAC (Pennsylvania, New Jersey, New York), but it is unlikely that any of these states will develop a RAC program anytime soon.

Within the RAC industry, several factors are limiting the growth of this market as well. The companies that control the marketplace in Arizona, Texas and Southern California appear not to be expanding the market base. Whether by design or market forces, this limits the availability of the expertise to the greater asphalt paving industry.

Several recent developments in this market sector could have positive impacts on the future demand for ground rubber. In Canada, several provinces have embarked on a program to research and use RAC. This is important because a successful RAC program in Canada would further dispel the misperception that RAC is only a warm weather technology. Additionally, the use of terminally blended rubber modified asphalt could stimulate the industry. Further, the Federal Highways Administration Quiet Roads initiative holds promise to boost this market.

Terminal Blending

The use of terminal blended rubber modified asphalt could have a major impact on the industry. Ground rubber has a specific gravity of 1.15 compared to approximately 1.000 for asphalt (binder). Therefore, settlement of the ground rubber is a major issue. Several companies claim to have overcome this problem with adding a polymer or other chemicals to the asphalt mix. Sometimes, companies constantly agitate the rubber modified asphalt prior to application to keep the rubber suspended in the matrix.

This technology potentially could be appealing to the asphalt industry because it does not need the same equipment as hot mix asphalt. Should this technology prove successful, it could help overcome significant obstacles impeding this market's growth and result in a significant increase in the demand for ground rubber, although it is too early to estimate the growth potential associated with this development. Estimates are that it could be another three years before this technology could begin to impact the markets for ground rubber.

Quiet Roads

The Federal Highway Administration (FHWA) Quiet Roads Initiative was designed to address road noise audible to residents in close proximity to major roadways. FHWA is researching the types of pavements that can be used as a means of abating or preventing noise from roadways. The use of RAC in an open graded friction course on highways is known to decrease road noise. RAC has been used successfully to reduce road noise in Arizona and California. Several states that have not had extensive experience with RAC will be putting down RAC to determine whether this technology can be used in their states to abate road noise. The states of Missouri, Washington and Nevada will be using RAC for road noise abatement projects in 2006 and 2007.

Should this technology be successful and other states begin to use RAC in ever increasing amounts, the level of demand for ground rubber in asphalt paving should increase. While this presents itself as a significant opportunity, it will likely be a gradual process. Several states plan on waiting three to four years before deciding whether the RAC applications were successful. If the Quiet Roads initiative does present itself as a market opportunity, the effects are not likely to be felt for at least another three to four years.

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.

In 2003, 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 and lower percentages 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 one-half to three percent levels that have been used in some applications.

Animal Mats

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).

Other Markets

The "other markets" category includes a number of other, smaller markets for ground rubber. Highlighted here are two such markets – rubber mulch and horse arenas. The demand for tire-derived mulch has grown over the past several years. This material, a one-to-two inch piece of rubber with 99 percent of the wire removed has established itself in the industrial and residential markets.

The increase in sales appears to be a function of two factors. First, the properties of the material (does not decay, does not attract insects, retains moisture in the soil, effectively eliminates weeds) are becoming more widely recognized. Second, one of the main competitive materials, wood chips, are being used as a fuel source at the pulp and paper mills as a source of energy, reducing their availability and increasing their relative costs. Demand for and sale of rubber-derived mulch should continue to increase over the next two years.

The use of tire material in horse arenas appears to have reached a steady-state status. The data obtained suggests that the demand for this three-eighths inch material has been stable over the past two years and is expected to remain so for the next two years.

6

Electric Arc Furnaces

In 2005, one and one-third million scrap tires (18.88 thousand tons) were utilized in electric arc furnaces in the United States. Scrap tires were first introduced into electric arc furnaces in the United States in 2003. Scrap tires are used 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 three beneficial resources for EAFs: a high carbon content, high-grade steel and energy. Scrap tires are also attractive to EAFs since tires can be used whole or in relatively large pieces (halved or quartered) and the facility receives a tip fee for accepting scrap tires. EAFs can also accept larger-sized tires (mining, grader, earth mover, farm tires) that have few, if any, other viable outlets.

While the combustible portion scrap tires is used as a source of energy, some carbon (about 68 percent of tire composition by weight) and most of the steel (about 12 percent of tire composition by weight) components of the tires are incorporated into the new steel product. This is close to closed-loop recycling of scrap tires.

Since 2003, the onset of the use of scrap tires in EAFs, two additional facilities have started using scrap tires, raising the total number of EAFs using scrap tire to four. The overall market has not reached the level that the RMA projected in the last market report. The projection of six to ten EAFs using scrap tires has failed to be realized.

While our research indicates that up to eight additional EAFs remain interested in using scrap tires, only one of these facilities has completed trials and received tentative permission to proceed with the use of scrap tires. An analysis of the market suggests there are several reasons for the lower than expected rate of usage.

First, tire supply issues and prevailing tipping fees can play a major role in geographic regions with relatively high levels of scrap tire generation and demand for scrap tires. The potential supply of whole tires to EAFs in these regions has been limited, if not unavailable. These are regions where the supply and demand for scrap tire-derived (processed) products (tire-derived fuel, ground rubber and civil engineering applications) are the point of equilibrium with the supply of scrap tires.

Furthermore, EAFs also have to directly compete with cement kilns for a supply of larger-sized, whole tires. Market conditions dictate that those markets that are willing to pay the most for tire-derived products will receive the greater amounts of these products. Consequently, the number of scrap tires available to EAFs and the tip fee offered to these facilities has been low. The combination of limited supply and no or relatively low tipping fees have caused EAF management to rethink the use of scrap tires.

In other regions of the country the location on the EAF is a rural setting and relatively distant from the sources of scrap tires. With the dramatic increase in fuel prices, scrap tire haulers have been less inclined to transport scrap tires over great distances, especially in those cases where they still have to pay a tipping fee. In these cases the combination of limited tire supply and economics has worked against the ability to guarantee a constant supply of scrap tires. The market conditions have also caused EAF management to delay or cancel the use of scrap tires.

Given that an EAF can accept larger scrap tires than the majority of scrap tire processing systems are willing or able to process, EAFs can provide an important niche market. This has been the case at the Nucor EAF in Auburn, New York, which makes use of a relatively high percentage of agricultural tires. In cases like this, where the EAF can attract a relatively constant quantity of scrap tires that are not normally collected and processed by the scrap tire infrastructure, the supply and the economics would probably be favorable, which would allow for the sustained use of scrap tires. This approach to attracting a supply is a function of the willingness of facility personnel to cultivate and develop such a supply chain. It is uncertain how many of the EAFs that have expressed an interest in making use of scrap tires could carry out this type of program.

Additionally, a patent issue exists that poses a challenge to this market. The introduction of whole tires into a “charge” bucket at an EAF was first used in the United States at a Nucor EAF in Nebraska. A then-employee of Nucor responsible for this project applied for and received a patent for this process through the U.S. Patent Office. An agreement between Nucor and the patent holder has apparently enabled Nucor to use the patented process in its facilities. Other EAF facilities interested in using tires as a charge material should research these patent issues as part of an assessment process.

Several EAF production managers have expressed concerns about the use of scrap tires relative to the quality of the steel product being manufactured. Concern about supply and an unwillingness to use scrap tires on a trial basis, in combination with any of the factors cited above have caused EAFs to postpone or abandon any plans to test or use scrap tires.

In these cases, the economics of negatively impacting the quality of steel products far outweighs any benefit from using scrap tires for any purpose. While there is no evidence to suggest that scrap tires have caused any degradation of the steel products generated at any of the EAFs worldwide, the production methods, raw materials and products made at EAFs vary.

There also were comments made by production managers that tire manufacturers could use either an ASTM 1070, 1080 or 1090 steel. While these are all high-grade materials, the variability could pose challenges in steel production. This lone factor appears to be sufficient to prevent several EAFs from using scrap tires. These concerns are unlikely to dissipate in the near term.

Over the past few years there have been a number of mergers and acquisitions within the steel industry. Conversations with steel industry sources indicate that additional mergers and acquisitions are likely in the near-term. This factor could also be delaying any changes in methods or materials at EAFs.

What should be noted is that of all the reasons given for the lack of expansion in this market, environmental considerations have not been mentioned as a concern. From the reports made available it is apparent that the use of scrap tires in EAFs has had no adverse impact on emissions associated with these operations.

On a worldwide comparison basis, the rate of usage of scrap tires in U.S. EAFs is second to Japan, which reports that some 15 percent of all scrap tires entering an end use market are used by EAFs. The level of scrap tires usage in U.S. EAFs is at present greater than the level of usage in Europe, the European scrap tire industry is making an effort to increase the number of tires going into EAFs. For more information, please visit the American Iron and Steel Institute website at http://www.steel.org/.

The current market conditions suggest that the use of scrap tires in electric arc furnaces will not be expanded to previously suggested levels and is likely to be a minor end use market. Given the current market conditions, our analysis suggests that there are two to three EAFs that could begin using scrap tires in the 2006-2007 timeframe, with two of these facilities being owned by Nucor. If the projections are correct, this would bring the total market use to approximately three million tires a year by the end of 2007 (please note that the data received for scrap tire usage in EAFs was in units, i.e., millions of scrap tires).

It also appears likely that any EAF using scrap tires will be doing so at a relatively low rate, suggesting a rate of usage in the range of 200,000 to 500,000 scrap tires per year per EAF. Furthermore it appears evident that the supply of these scrap tires will come from sources fairly close to the facility, perhaps no greater than 50 – 75 miles from the facility.

RMA projects that growth in this market area will be incremental in the next two years, given the combination of adequate scrap steel supplies, the downward pressure on tip fees for scrap tires and the diminished availability of scrap tires, coupled with internal management considerations.

7

Other Markets

Cut, Punched and Stamped Rubber Products

There was more information supplied on this market segment in 2005 than in any previous year. In 2005, approximately six million scrap tires were cut, punched or stamped in the United States (100.51 thousand tons). This market remained constant in 2005.

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.

Export of Tires

The business of exporting sound used tires continues. RMA received more information in 2005 about this market niche than any previous year's data collection effort. Based on this information the number of tires exported is reported to be nearly seven million tires per year (111.99 thousand tons). 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.

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 consumed approximately three million tires in 2005 (47.59 thousand tons).

8

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 or monofills. Additionally, some states use scrap tires as fill in land reclamation projects. RMA does not view these practices as end-use market applications, but as disposal options.

Tires Land Disposed in 2005

The data obtained in the questionnaires from state scrap tire regulators was somewhat incomplete relative to the number of tires that were landfilled in 2005. RMA conducted telephone interviews with major collectors and processors of scrap tires in those states that that allow landfilling or monofilling scrap tires or use tires in reclamation projects.

RMA estimates that 42.42 million scrap tires were land disposed in 19 states in 2005 (477.15 thousand tons). This represents approximately 14 percent of the scrap tires generated in the United States in 2005. This may seem to be an increase since 2003 when RMA reported that nearly 27 million, or about nine percent of the total scrap tires generated, went into landfills. However, the 2005 data includes those tires consumed in reclamation projects as well as those landfilled or monofilled, so a comparison with 2003 data is not appropriate in this case.

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 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 landfills may be the most reasonable and cost-efficient management option for scrap tires.

Landfills also provide two other important features for the scrap tire industry. Sometimes, 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 properly landfill this material; indeed several states that have a complete ban on tires in landfills have a stipulated exclusion for these situations.

Second, landfills provide a disposal option for tire shredder residue (the tire wire, textile and adhered rubber that are byproducts of ground rubber processing). In some cases, the scrap tire processor does not have the equipment to further process this material into a salable material or available markets for it. The ability to landfill or otherwise manage tire shredder residue will remain important to the industry until markets are created for this material.

Monofills

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. RMA is unaware of a single case in which previously monofilled tires were mined for market applications. Still, placing scrap tires into monofills is preferable to above-ground storage in piles, especially if the piles are not well managed.

Land Reclamation

Scrap tire shreds have been used for land reclamation. In this process, rough shreds are used as a fill material on land that has been mined or subjected to significant erosion and is in the process of being restored (reclaimed). Tires are used to level out the contour of the land before the land is covered with soil and reseeded.

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.

In its initial report on scrap tire issues in 1990, EPA estimated that there were between two and three billion scrap tires in stockpiles in the U.S. RMA refined that estimate in ensuing years and estimates that about one billion tires were in stockpiles in 1990. 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.

Scrap Tire Stockpiles in 2005

In 2005, an estimated 188 million tires were in stockpiles across the United States, compared with 275 million at the end of 2003. Appendix B shows state estimates of the numbers of tires remaining in stockpiles in the U.S. Figure 7 shows the reduction in the number of scrap tires in stockpiles since 1990. State data collected by RMA indicate that scrap tire stockpiles are concentrated in a small number of states.

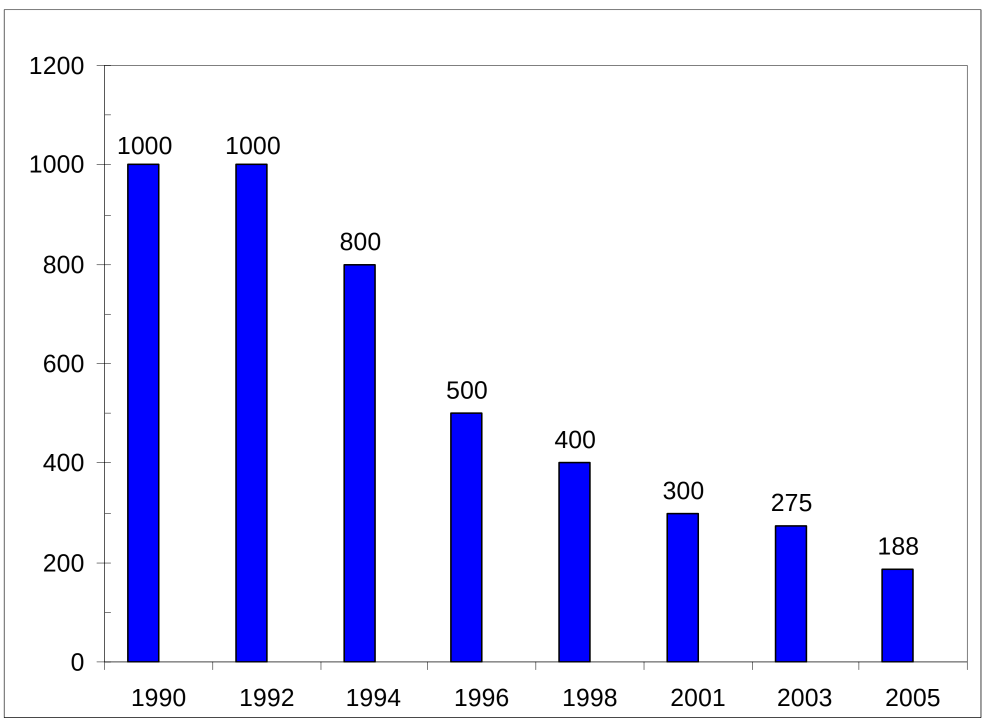

Figure 7: Millions of Scrap Tires Remaining in U.S. Stockpiles, 1990 - 2005.

At the end of 2005, 84 percent of all stockpiled tires in the U.S. were located in just seven states: Colorado (40 million), New York (37 million), Texas (24.6 million), Connecticut (20 million), Alabama (18 million), Michigan (10.6 million) and Pennsylvania (nearly eight million). RMA's policy on reporting stockpile data has been to use the data provided by the states. Interestingly, some states reported fewer tires in stockpiles than the number reported two years ago without abating any tires over this period (Massachusetts, New Jersey and Washington).

The last two years have seen a significant amount of abatement activity and few new piles created. The combination of increased market demand, improved collection practices, better law enforcement and a greater public awareness of the dangers associated with unlawful dumping have resulted in a significant improvement in this important arena. It should also be reiterated that the decreased number of scrap tires in stockpiles is a function of improved assessments of the actual number as much as the abatement of stockpiled tires.

Scrap tire legislation was enacted in Virginia, Washington and Missouri that will allow these states to begin or complete stockpile abatement. New York, New Jersey and Alabama are in the beginning of the process to abate the major stockpiles in those states.

A continued reduction in stockpiles is likely over the next several years, although it may not be at the rate of decrease that was experienced between 2003 and 2005. Iowa, Ohio, Missouri and Virginia should complete abatement programs within the next two years, but these states contain a total of less than eight million tires in stockpiles. If continued significant progress is to be made, Alabama, New York, New Jersey and Michigan need to have aggressive abatement programs. These four states contain almost 67 million scrap tires.

Texas and Pennsylvania, which still have significant stockpiles, do not have dedicated scrap tire program funds for scrap tire stockpile abatement programs. Officials in both states have indicated that they intend to approach their respected state legislature to secure funds for abatement projects. Given that, there is no guarantee that either state will conduct abatement activity.

The remaining states with relatively large amounts of stockpiled tires (Colorado, Connecticut, Massachusetts, Delaware, North Dakota and Idaho) contain some 74 million stockpiled scrap tires. These states either do not have a funded scrap tire program or are not using funds for stockpile abatement. Consequently, it is highly probable that more than half of the currently reported stockpiled scrap tires will remain unabated for the foreseeable future.

Stockpile Mapping

Several states and some U.S. EPA Regions have begun to use satellite imagery to map tire stockpiles within their borders. This technology enables a jurisdiction to locate previously unknown, often smaller, stockpiles. Additionally, this technology can assist in assessing the estimated size of a particular stockpile. Through this information, states can more effectively plan and budget for abatement projects.

U.S. EPA Region V has mapped the scrap tire stockpiles in each state within its jurisdiction. California has also conducted a mapping project for the state. Stockpile mapping is discussed in more detail in the stockpile abatement guidebook recently developed by U.S. EPA Region V and described below.

Development of Stockpile Abatement Guidebook

In 2005, U.S. EPA and Illinois EPA combined resources to create The Complete Scrap Tire Cleanup Guidebook. This document provides a much-needed tool for abating scrap tire stockpiles. This comprehensive guide was developed by synthesizing the expertise of scores of professionals in the field. The Guidebook provides state and local officials with all of the information needed to effectively manage a scrap tire abatement project.

The document reviews components of an abatement project, bidding out a cleanup project, working with contractors and implementing effective prevention programs to keep new stockpiles from forming. The Guidebook is available online at http://www.epa.gov/reg5rcra/wptdiv/solidwaste/tires/guidance/.
This website also includes sample requests for proposals and other relevant documents from several states to assist states in developing abatement programs.

9

State Performance and Evaluation

State Performance

The previous edition of this report published individual state scrap tire management data for the first time. In this edition of the report, RMA is again publishing individual state data. Now that two consecutive volumes of individual state data are available, RMA was able to benchmark state performance and begin to evaluate trends. This trend analysis is available in two components: (1) individual state performance and improvement rankings (2) regional market analysis (by EPA Region), contained in the following chapter. The purpose of ranking states is two-fold: to recognize those states that have achieved scrap tire management success and identify those states that need heightened focus and resources devoted to scrap tire issues.

Two of the key criteria evaluated in this and the following chapter are (1) state scrap tire markets and (2) existing state scrap tire historical stockpiles and state remediation efforts. Figures 8 and 9 illustrate state-by-state scrap tire market and stockpile statistics. Figure 8 shows the percentage of annually-generated tires each state sent to market in 2005. Figure 9 shows the millions of scrap tires remaining in stockpiles in each state. Of note, several states have abated all known stockpiles. Several other states did not report or did not know the number of scrap tires in stockpiles within its borders.

State Evaluation

For the first time in this report, RMA has evaluated individual states in scrap tire management. RMA created two state ranking categories: performance and improvement. In both categories, state performance was evaluated in several areas, in terms of the absolute number of scrap tires, as well as the per capita number of scrap tires. RMA felt that viewing state performance both in absolute volume of tires and on a per capita basis rewarded the efforts of states with large populations and more significant annual generation, while the per capita evaluation acknowledged state efforts, regardless of volume, to address annually generated or stockpiled tires and work toward a sustainable program within the state.

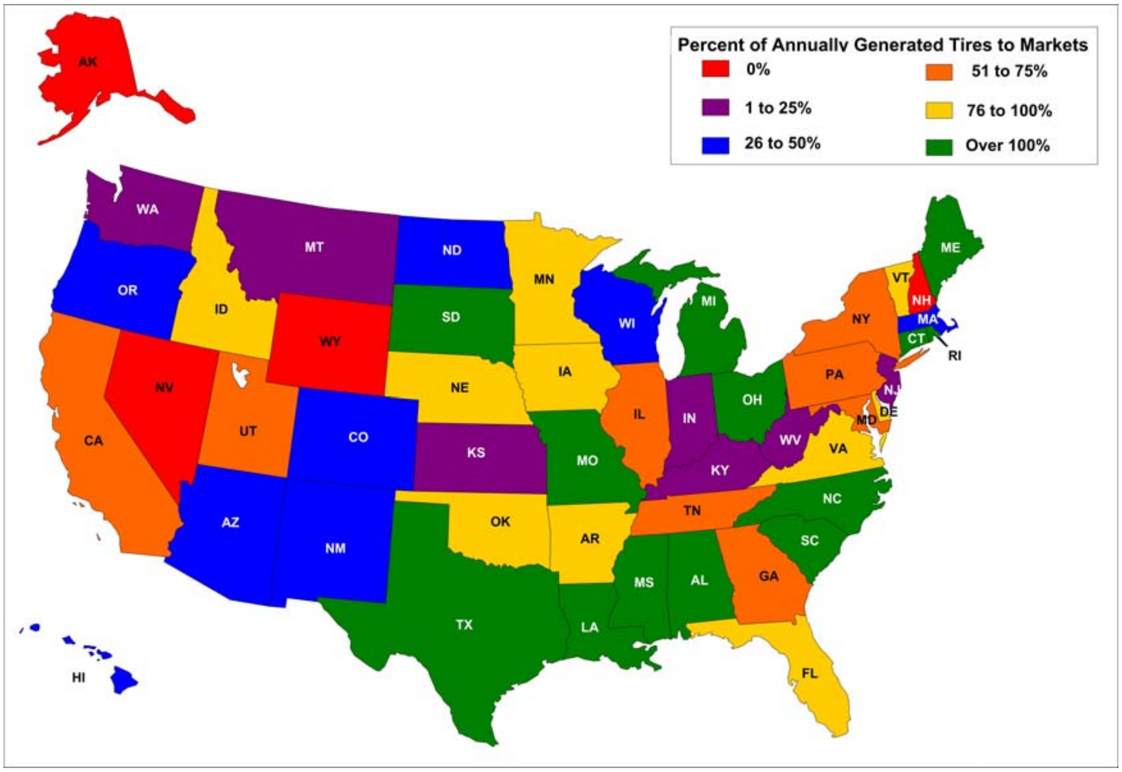

Figure 8: U.S. State Scrap Tire Market Percentages, 2005.

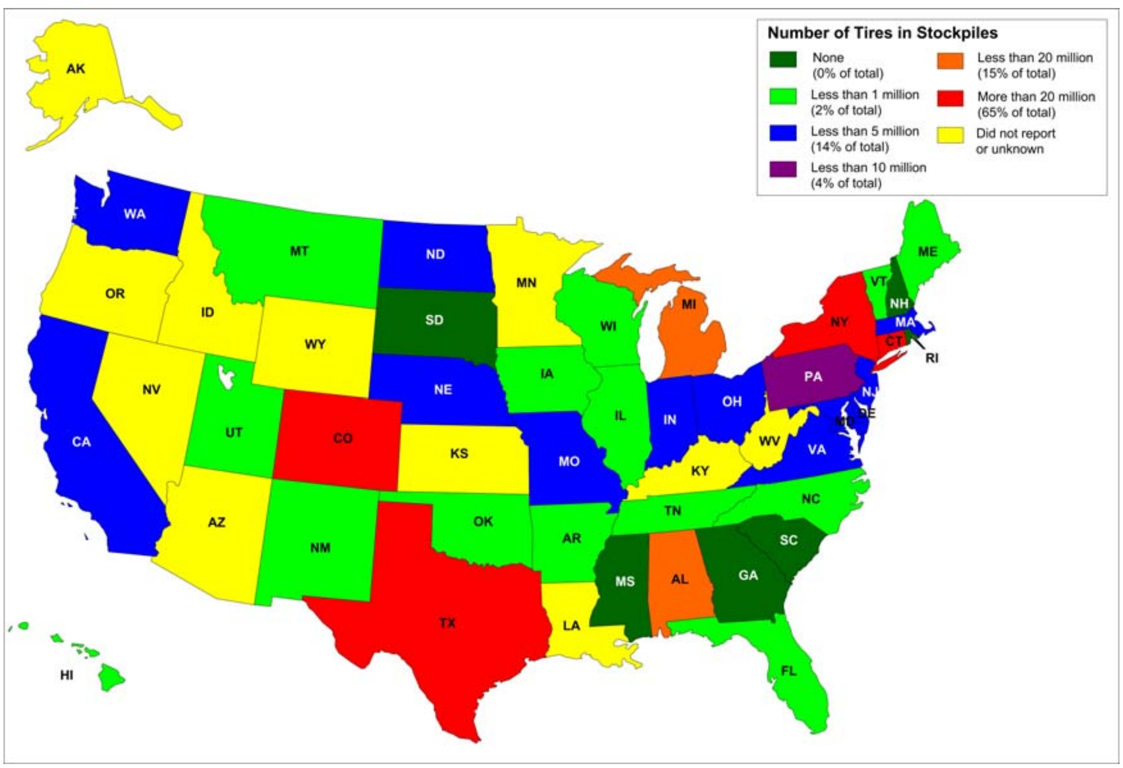

Figure 9: Scrap Tires Remaining in Stockpiles in the U.S., 2005.

State Performance Rankings

In the performance category, RMA evaluated state performance in markets, stockpiles and land disposal, both in terms absolute numbers and numbers per capita. States that had more tires in markets, fewer tires in stockpiles and fewer tires that were land disposed were ranked higher than other states. States that did not report the number of tires in stockpiles were not viewed positively for ranking purposes.

The top performing states exhibited strong, diverse markets. Typically, TDF was the anchor market in these states but the states had other well-developed markets as well. Most of these states had few, if any, tires remaining in stockpiles and did not land dispose significant numbers of tires.

In 2005, South Carolina received the number one ranking, followed by Maine, North Carolina, Florida and Mississippi. South Carolina, the top performer in 2005, sends all of its annually-generated scrap tires to markets. This is a significant achievement. RMA commends South Carolina for its efforts. South Carolina generates approximately six and one-half million tires and sends nearly eight million tires to markets within the state. TDF consumes the majority of the scrap tires (six million), while the remaining tires are used in civil engineering applications (many in septic drainage fields) and rubber modified asphalt.

Table 7 shows the performance rankings of all 50 states.

Table 7: State Performance Rankings, State Scrap Tire Management, 2005.

State	*Performance Rank*
South Carolina	**1**
Maine	**2**
North Carolina	**2**
Florida	**4**
Mississippi	**5**
Illinois	**6**
Ohio	**7**
Missouri	**7**
Rhode Island	**7**
Georgia	**7**
South Dakota	**7**
Oklahoma	**12**
California	**13**
Tennessee	**13**
Michigan	**15**
Vermont	**15**
Virginia	**15**
Iowa	**18**
Texas	**19**
Arkansas	**20**
Utah	**21**
Maryland	**22**
Pennsylvania	**23**
Wisconsin	**24**
Alabama	**25**

State	*Performance Rank*
Nebraska	**26**
New Mexico	**27**
Connecticut	**27**
Massachusetts	**29**
Hawaii	**30**
New Hampshire	**31**
Louisiana	**32**
New York	**33**
Delaware	**34**
New Jersey	**35**
Montana	**36**
Washington	**37**
Minnesota	**38**
Indiana	**39**
Idaho	**40**
Arizona	**41**
Oregon	**42**
North Dakota	**43**
Colorado	**43**
West Virginia	**45**
Kentucky	**46**
Kansas	**47**
Nevada	**48**
Alaska	**49**
Wyoming	**49**

Of the top five performing states, four states are in the southeast, EPA Region IV (South Carolina, North Carolina, Florida and Mississippi). As discussed in more detail in the following chapter, this region of the country has seen dramatic growth in the TDF market. Each of these four states has exceptionally strong TDF markets – particularly from pulp and paper mills. Maine, in EPA Region I, likewise has a strong TDF market comprised of pulp and paper mills. Maine also has a well-developed civil engineering market.

State Improvement Rankings

RMA also assessed which states have improved, according to several scrap tire management parameters since 2003. To evaluate improvement, RMA compared state trends between 2003 and 2005 in terms of improvement in the number of scrap tires consumed by markets and reduction of historical stockpiles, again on absolute and per capita bases.

Table 8: 20 Most Improved States, State Scrap Tire Management, 2003 – 2005.

State	*RANK*
Texas	1
Alabama	2
Ohio	3
Michigan	3
Massachusetts	5
New Jersey	5
Missouri	7
Vermont	7
Washington	7
Rhode Island	10
Delaware	10
Indiana	10
Hawaii	13
Pennsylvania	14
Maine	15
North Carolina	15
Montana	15
Iowa	18
New York	18
Minnesota	20

In this category, RMA is publishing the 20 most improved states. The other 30 states fall into one of two categories: states where performance was inadequate between 2003 and 2005 and states where performance remained constant and strong between 2003 and 2005. Table 8 lists the top 20 most improved states.

The most improved state for the period 2003 to 2005 was Texas, followed by Alabama, Ohio, Michigan and Massachusetts. In the cases of Texas, Ohio, Michigan and Massachusetts, the high improvement rankings can be attributed to reported progress in the area of stockpile remediation. Texas abated over 28 million scrap tires. While Ohio removed over 14 million tires from stockpiles, Michigan removed nearly six million and Massachusetts reportedly removed nearly seven million tires.

Alabama's improvement can be attributed more to a dramatic increase in the number of scrap tires being consumed in end-use markets. While Alabama did report abatement of two million tires in 2004 and 2005, it is more impressive that scrap tire markets expanded by eight fold during the period to over 18 million tires, or over 400 percent of annual generation. Alabama is poised to continue and accelerate its improvement, with a number of recent announcements of major remediation projects to address the 18 million scrap tires still in stockpiles.

10

U.S. Regional Scrap Tire Market Analysis

The markets for scrap tires continue to be regionally based. 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. Figure 10 shows the percentage of scrap tires going into end-use markets in each U.S. EPA Region in 2005.

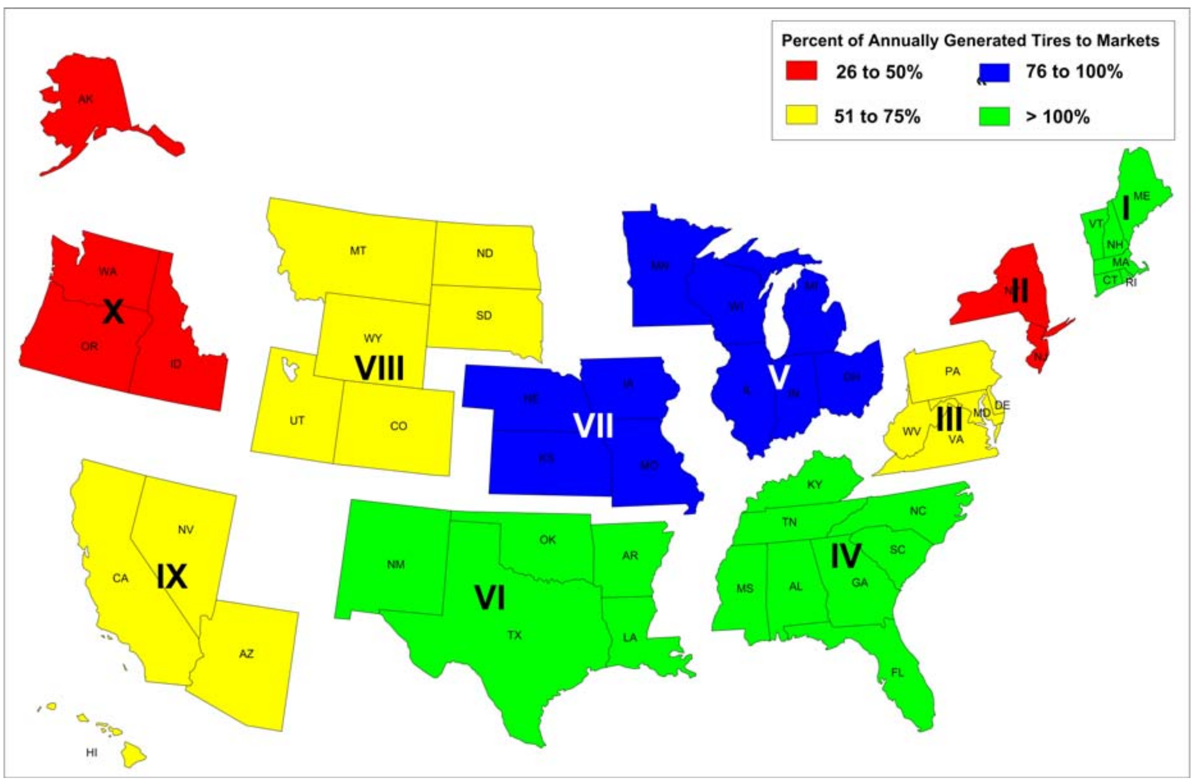

Figure 10: Percentage of Scrap Tires to Market by U.S. EPA Region, 2005.

Generally, scrap tire markets in the eastern half of the U.S. remain strong. In the middle 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 and Texas has a strong TDF market, while surrounding states maintain weak markets with significant challenges. Figure 11 illustrates the market distribution in each EPA region.

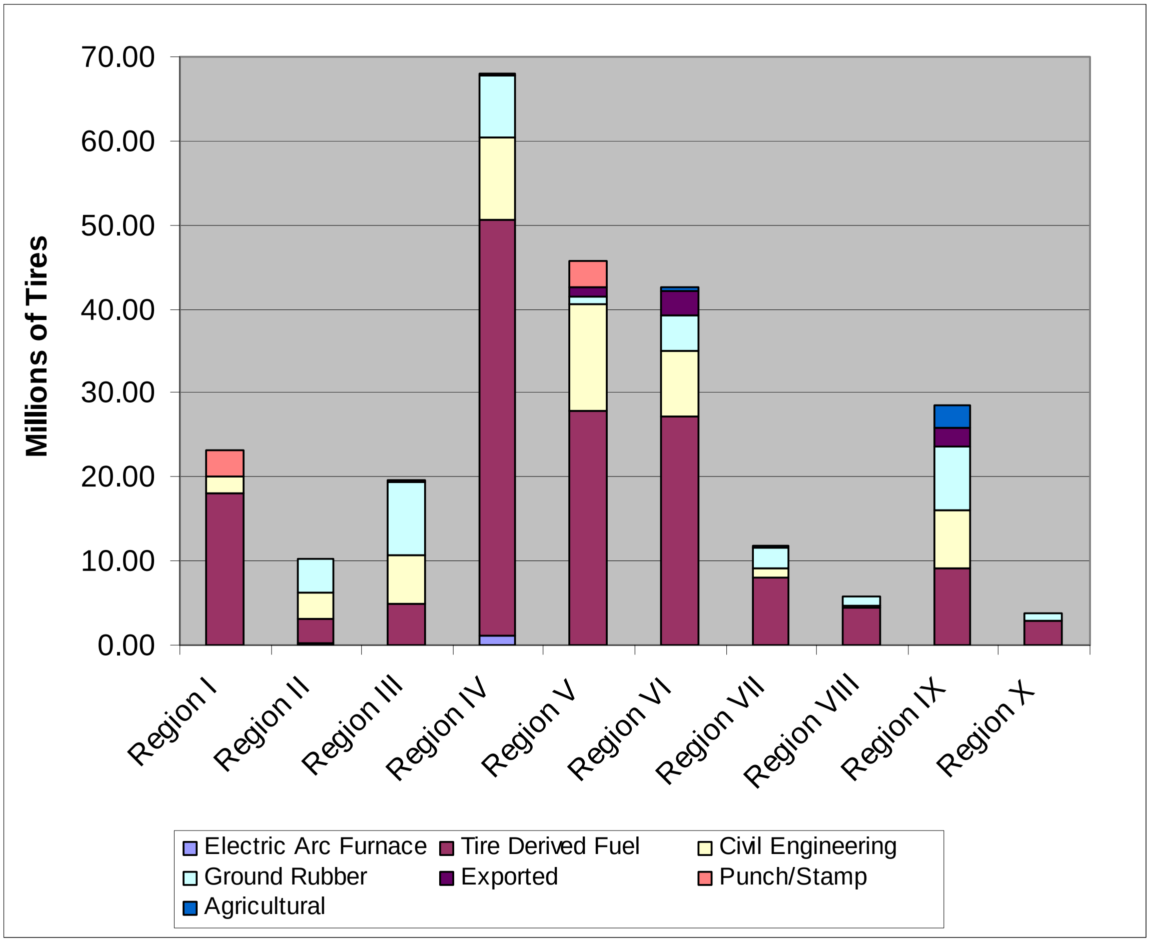

Figure 11: Scrap Tire Market Distribution by U.S. EPA Region, 2005

Figure 12 shows the number of scrap tires remaining in stockpiles in each U.S. EPA Region.

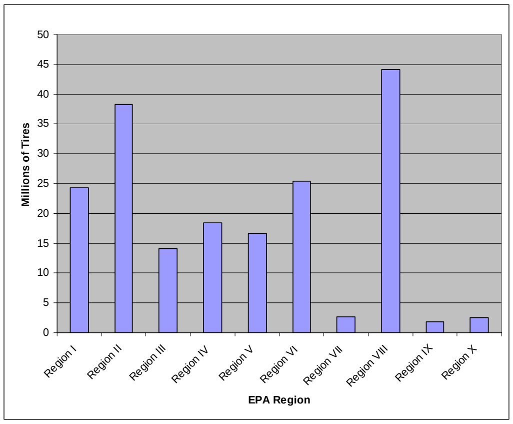

Figure 12: Millions of Scrap Tires Remaining in Stockpiles, by U.S. EPA Region, 2005.

U.S. EPA Region I

Maine, Vermont, New Hampshire, Massachusetts, Rhode Island and Connecticut

U.S. EPA Region I maintains strong markets for scrap tires. 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). Figure 13 shows the disposition of scrap tires in U.S. EPA Region I. Figure 14 shows the scrap tire market trends for 2003 to 2005.

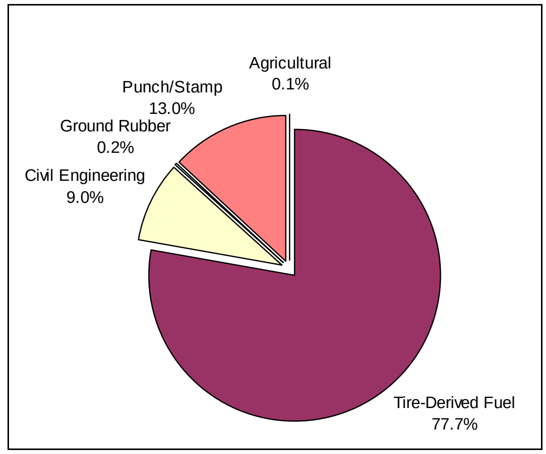

Figure 13: U.S. EPA Region I Scrap Tire Disposition, 2005.

There is presently a demand for over 26 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.

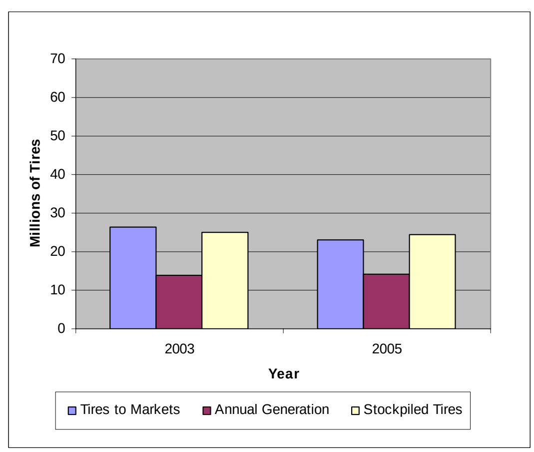

Figure 14: U.S. EPA Region I Comparative Scrap Tire Statistics, 2003 - 2005.

U.S. EPA Region II

New York and New Jersey

Scrap tire markets have not been established in U.S. EPA Region II. Figure 15 shows the disposition of scrap tires in U.S. EPA Region II.

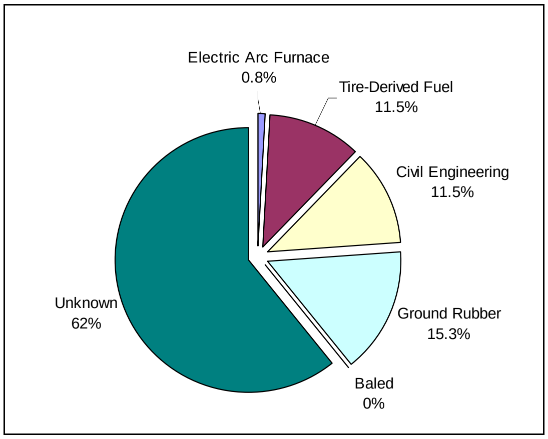

Figure 15: U.S. EPA Region II Scrap Tire Disposition, 2005.

There are no large-scale markets in New Jersey, although some tire processors operate 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.

Scrap tire legislation enacted in 2006 in New Jersey was designed to focus on stockpile abatement, but no markets in the state exist that could make use of the stockpiled tires. There has been some interest in civil engineering applications in the state, but no advancement in this market has occurred to date. Recently, a New Jersey ground rubber producer went out of business.

Since the last report, two companies in New York began using TDF and are supplying market demand for TDF in the Western and North Central regions of the state. Of particular interest, TDF is being shipped from the eastern portion of the state to western New York to meet market demand. These markets were developed without assistance from New York state agencies.

As mentioned earlier, scrap tires generated on either side of the Hudson River and down to the New York City area are generally taken to Connecticut. In areas that are absent any large-scale market tires are flowing to larger-scale processors. Scrap tires in the southern-tier of the state are taken into Pennsylvania. Scrap tires in the central portion of the state are being used in an electric arc furnace.

New York enacted a funded scrap tire management program in 2002. The state began to abate stockpiles and developed a scrap tire marketing plan. While these are positive events, the abatement program has nearly halted and the market develop plan has yet to be unveiled.

To further complicate the situation, the New York Department of Transportation appears to be unable to use all of the processed tires coming out of the abatement program in civil engineering projects, contrary to earlier plans. To date, the state has given two grants for the expansion of processing capacity for ground rubber.

Figure 16 shows the scrap tire trends in Region II between 2003 and 2005.

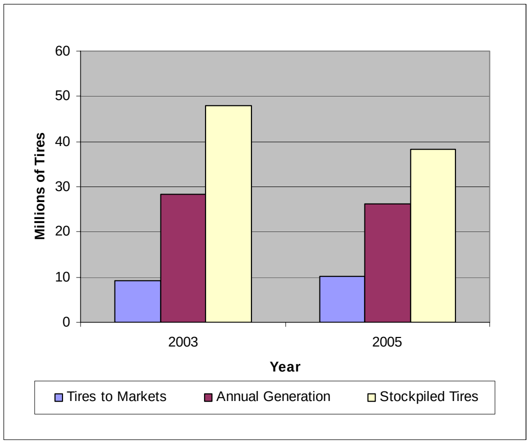

Figure 16: U.S. EPA Region II Comparative Scrap Tire Statistics, 2003 – 2005.

U.S. EPA Region III

Delaware, Maryland, Pennsylvania, Virginia and West Virginia

U.S. EPA Region III has varied scrap tire programs. Figure 17 illustrates the market diversity in this region.

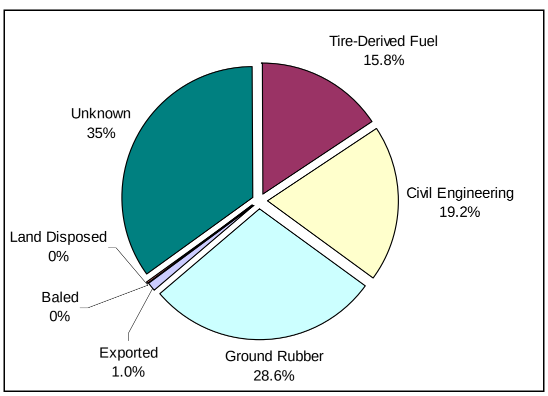

Figure 17: U.S. EPA Region III Scrap Tire Disposition, 2005.

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. Delaware recently enacted state scrap tire legislation, leaving Alaska as the only state without legislation in place. Delaware has a major processor of coarse rubber (quarter inch, half inch and three-quarter inch sized particles) that 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. The majority of annually-generated tires go 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 it has made progress in stockpile abatement.

Figure 18 shows the trends in scrap tire statistics in U.S. EPA Region III in the period 2003 – 2005.

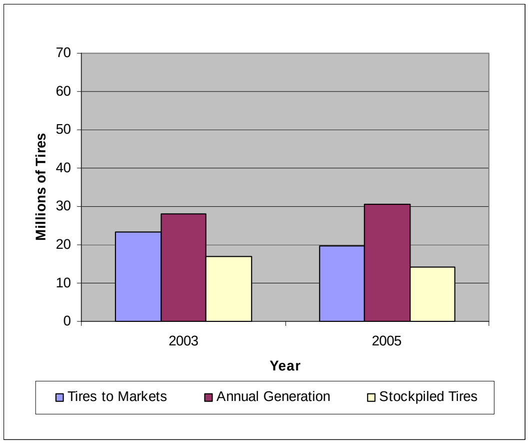

Figure 18: U.S. EPA Region III Comparative Scrap Tire Statistics, 2003 - 2005.

U.S. EPA Region IV

Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina and Tennessee

A strong TDF market is well established in U.S. EPA Region IV, supported by several large-scale pulp and paper mill boilers and cement kilns. Figure 19 shows the scrap tire disposition in Region IV in 2005.

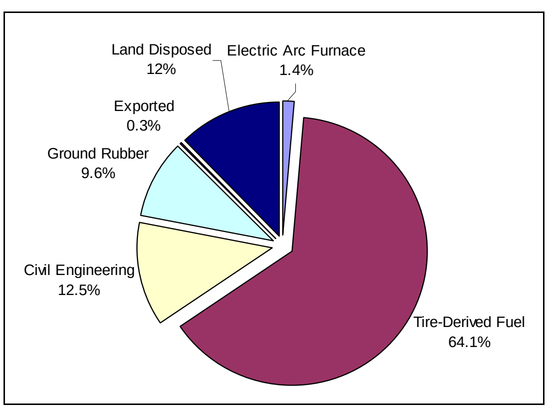

Figure 19: U.S. EPA Region IV Scrap Tire Disposition, 2005.

Some of the annually-generated scrap tires are landfilled or monofilled. 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.

However, Florida has seen some market changes since the last report. Florida has experienced a reduction in the amount of rubber modified asphalt used, while its TDF markets have not been operating on a consistent basis. Furthermore, there are no significant large-scale markets in the Southern portion of the state. Increased transportation costs result in order to bring scrap tires to the processors in the central and northern portions of the state. Furthermore, there has been a turn down in the ground rubber production and demand situation in the state.

Alabama has a strong TDF market that is starting to slow the flow of tires to the major monofill in the state. Alabama is home to two major cement kilns using TDF, an electric arc furnace using tires as a charge material and a major monofill. Some scrap tires from the panhandle of Florida still 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. In early 2006, an electric arc furnace began to use tires as a charge material. Aside from the use of TDF, no other markets have been developed. To satisfy market demand, tires are imported from as far away as Texas.

North Carolina's program continues to allow monofills, which consume approximately 25 percent of the annually-generated tires. In the last two years, North Carolina has developed a TDF market. Some tires are processed into materials 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.

In South Carolina, all of the annually-generated scrap tires go to markets, both in and out of state. Most are collected and then transported and processed out-of-state (either in North Carolina or Georgia), and returned to South Carolina TDF and rubber-modified asphalt markets. A significant amount of TDF is sent into South Carolina from states outside of the immediate area as well. Due to the elevated level of demand for TDF, most, if not all of the civil engineering uses for scrap tires have diminished greatly.

Georgia also has a well-developed market infrastructure. The state's annual generation feeds a significant TDF market, consisting of three pulp and paper mill boilers. These markets also consume tires from South Carolina and Florida.

Tennessee has a dual approach to scrap tire management: viable TDF markets along with legal landfilling. Due to the state's geography, the TDF markets in the south central portion of the state are as likely to receive tires from Georgia, Alabama and Mississippi as from in-state sources. TDF markets in western Tennessee receive tires from Alabama, Mississippi, Arkansas and Texas.

Kentucky has developed tire processing capacity and a TDF market, although it is unclear whether all of its tires are directed to markets.

Figure 20 compares 2003 and 2005 U.S. EPA Region IV scrap tire statistics.

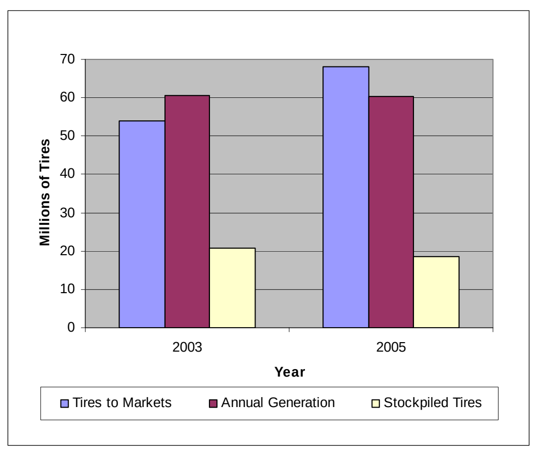

Figure 20: U.S. EPA Region IV Comparative Scrap Tire Statistics, 2003 - 2005.

U.S. EPA Region V

Indiana, Ohio, Illinois, Minnesota, Michigan and Wisconsin

U.S. EPA Region V has several strong markets in various parts of the region. Figure 21 shows the various scrap tire markets in 2005.

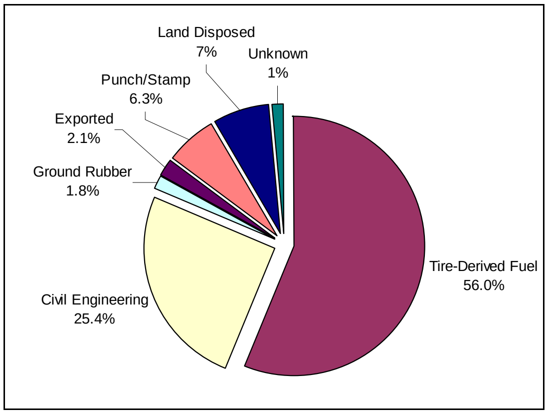

Figure 21: U.S. EPA Region V Scrap Tire Disposition, 2005.

Over the course of the past several years, Ohio has allowed the construction of monofills, to which a significant number of scrap tires continue to be shipped. In recent years, Ohio has expanded its TDF and civil engineering markets. Additionally, Ohio-generated scrap tires are being processed into TDF and shipped to markets in other states.

Michigan continues to have a significant TDF market, which is the only major market for scrap tires in that state. The demand for TDF in Michigan has created a demand-pull situation in the state, drawing processed tires from Ohio, Indiana and Illinois.

The recent loss of two TDF end users in Michigan will have long-term impact in the market dynamics, considering that no excess demand exists to consume the newly-available additional supply of TDF. There could be a shift in the supply dynamics, probably causing the TDF transported from the furthest point to be redirected to markets closer to the source.

Illinois has recently lost some TDF users, but has regained a TDF end user that had previously discontinued TDF use. Tires from adjacent states are still brought into the state to be processed and then shipped to TDF markets in adjacent states.

Wisconsin has experienced resurgence in the TDF market and the processing infrastructure instate. While this is a welcome improvement, the supply of TDF is satisfied from both in and out of state suppliers. TDF remains the only major market for scrap tires in Wisconsin.

Indiana has the highest number of processors in any state but continues to seek in-state markets for its scrap tires. Some scrap tires from Indiana are shipped into Illinois and Michigan to be used as TDF, while tires that remain in the state likely are stockpiled or landfilled.

Minnesota has a well-established infrastructure for collection, processing and transporting scrap tires that 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.

Figure 22 shows a scrap tire summary for U.S. EPA Region V, comparing 2003 and 2005.

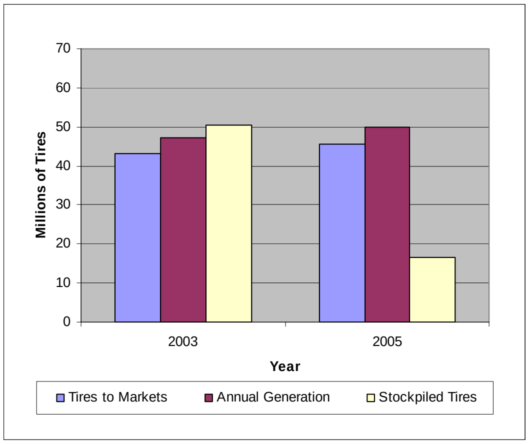

Figure 22: U.S. EPA Region V Comparative Scrap Tire Statistics, 2003 - 2005.

U.S. EPA Region VI

Arkansas, Louisiana, New Mexico, Oklahoma and Texas

U.S. EPA Region VI has robust and diverse markets, illustrated in Figure 23.

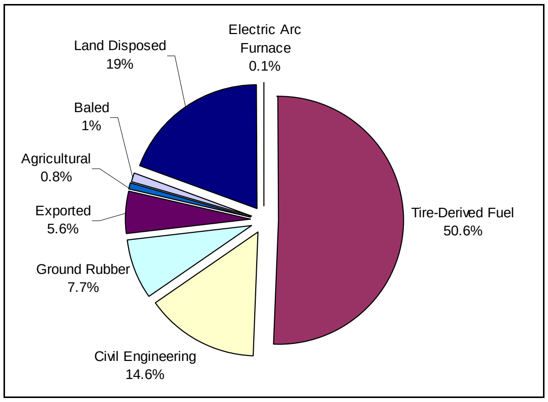

Figure 23: U.S. EPA Region VI Scrap Tire Disposition, 2005.

In Arkansas, each county, or a group of counties, is responsible for managing its tires. Consequently, tires are managed in several ways. While many tires are shredded and landfilled, TDF markets in-state have been increasing. Additional Arkansas tires are shipped into markets in bordering states.

In Oklahoma, three cement kilns continue to 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. One ground rubber producer operates in Oklahoma. The state continues to move toward using rubber-modified asphalt. Evidently, 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 or processed into TDF for in-state use or transported to Alabama markets.

Texas has a very dynamic TDF market, with seven cement kilns using TDF. This demand is supplied primarily from in-state supply. Recently the state has begun using a notable amount of rubber modified asphalt and now has an in-state ground rubber processor. Over the past two years the state has made significant progress in abating the two largest stockpiles. The tires abated and processed from these piles are generally shipped to pulp and paper mills in Louisiana. When the abatement projects terminate at the end of 2006, there will be a slight shift in the supply dynamic.

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, the state seeks 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.

Figure 24 shows progress since 2003 in U.S. EPA Region VI scrap tire statistics.

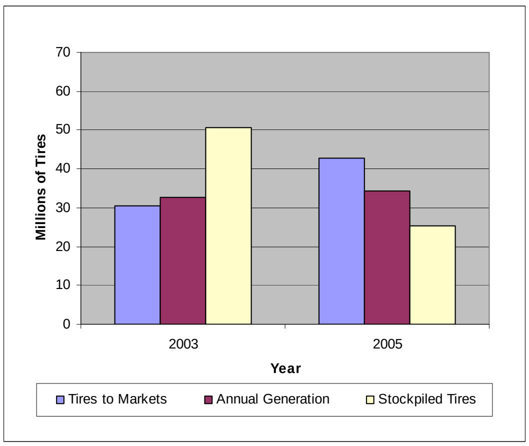

Figure 24: U.S. EPA Region VI Comparative Scrap Tire Statistics, 2003 - 2005.

U.S. EPA Region VII

Iowa, Kansas, Nebraska and Missouri

U.S. EPA Region VII is characterized by areas with strong markets and others with significant regulatory or market challenges. Scrap tires in this region are either used as TDF or landfilled. This region has few large-scale scrap tire stockpiles. Figure 25 shows the scrap tire market distribution in U.S. EPA Region VII.

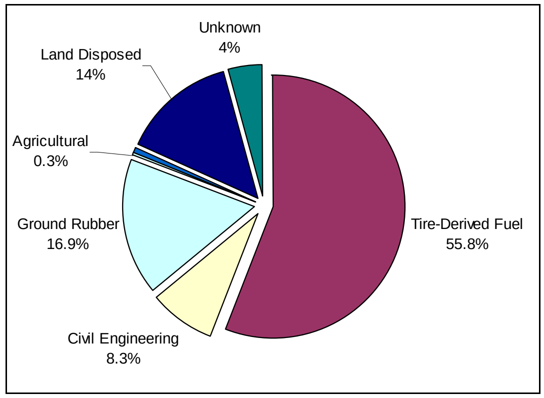

Figure 25: U.S. EPA Region VII Scrap Tire Disposition, 2005.

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 Kansas TDF market gets its supply from Missouri.

Nebraska is shifting the focus of its scrap tire program. There appears to be an emerging TDF market, although the onset of TDF use has yet to occur. If and when this does occur, most of the scrap tires in the more densely populated eastern portion of the state provide an adequate supply. Scrap tires in the western portion of the state will likely continue to be landfilled.

Figure 26 shows comparative data for U.S. EPA Region VII in 2003 and 2005.

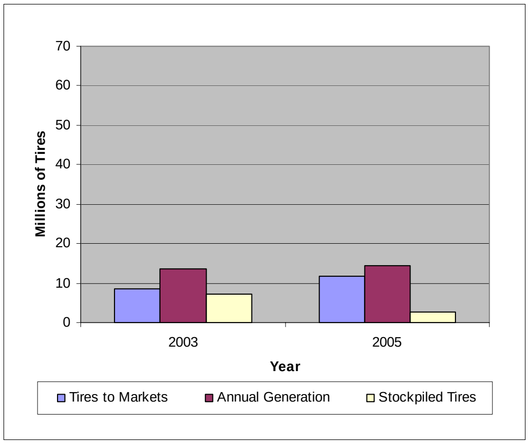

Figure 26: U.S. EPA Region VII, Comparative Scrap Tire Statistics, 2003 - 2005.

U.S. EPA Region VIII

Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming

U.S. EPA Region VIII has few scrap tire markets overall. Large expanses of land combined with low population densities present market challenges but also a lower annual generation of tires than other EPA regions. Figure 27 shows the disposition of scrap tires in U.S. EPA Region VIII. Figure 28 shows the comparison of 2003 and 2005 data.

Colorado is looking to improve its scrap tire infrastructure (collection of fees). Markets in Colorado are limited to one cement kiln and one processor and manufacturer of coarse-sized particles for an array of products. Still scrap tires are accumulating at landfills. Unfortunately, little immediate movement is expected.

Utah subsidizes end-users of Utah-generated scrap tires and has one TDF user. Utah and Wyoming primarily landfill annually-generated scrap tires. There is little likelihood of short-term market development.

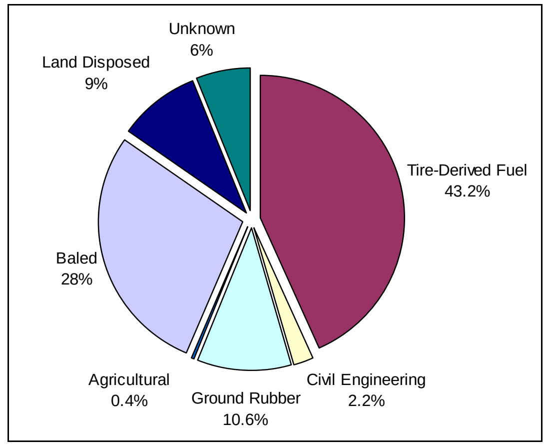

Figure 27: U.S. EPA Region VIII Scrap Tire Disposition, 2005.

The Montana scrap tire program is considering development of some markets. At present, the vast majority of tires are land disposed. Montana also enacted regulations banning baled tires.

North and South Dakota have limited scrap tire markets due to demographics and geography – sparse population centers separated by great distances. Both states landfill most scrap tires.

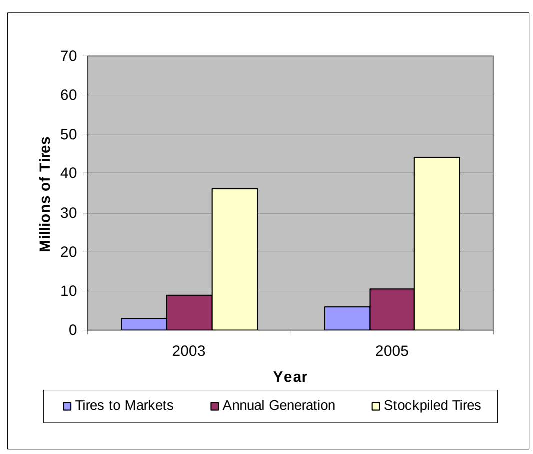

Figure 28: U.S. Region VIII Comparative Scrap Tire Statistics, 2003 - 2005.

U.S. EPA Region IX

Arizona, California, Hawaii and Nevada

U.S. EPA Region IX has several regions with strong markets for scrap tires, including Arizona and parts of California and Hawaii. Other areas landfill the majority of scrap tires. Figure 29 shows the disposition of scrap tires in EPA Region IX.

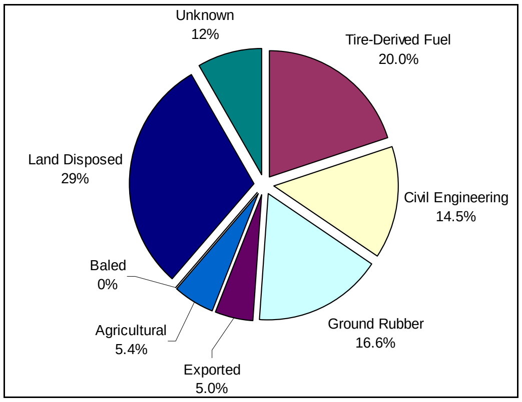

Figure 29: U.S. EPA Region IX Scrap Tire Disposition, 2005.

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.

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.

Figure 30 shows trends in scrap tire disposition between 2003 and 2005 in U.S. EPA Region IX.

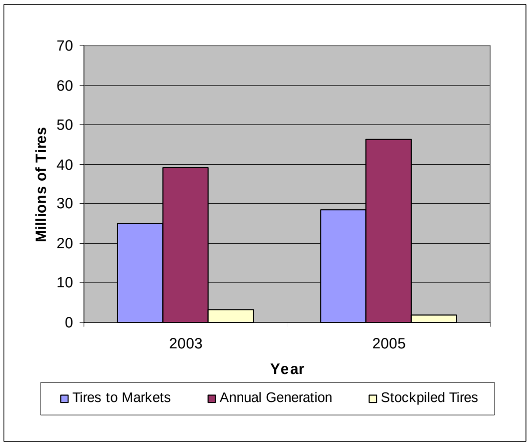

Figure 30: U.S. EPA Region IX Comparative Scrap Tire Statistics, 2003 – 2005.

U.S. EPA Region X

Alaska, Oregon, Idaho and Washington

U.S. EPA Region X is challenged by geography and distances between population centers. Figure 31 shows the disposition of scrap tires in Region X in 2005.

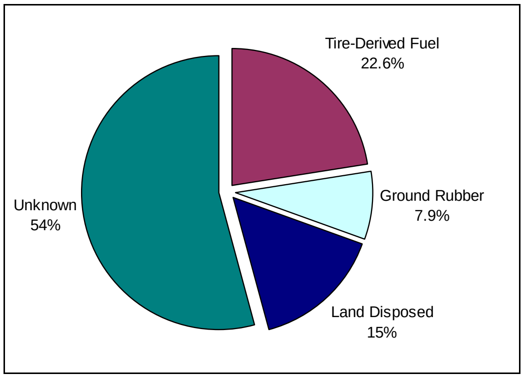

Figure 31: U.S. EPA Region X Scrap Tire Disposition, 2005.

In Washington, a small percentage of scrap tires are used for TDF and some civil engineering applications, while the rest of the tires along the western side of the state (west of the Cascade mountain range) are transported to Oregon to be land disposed. In Eastern Washington, the Idaho Panhandle and Western Montana, a considerable number of tires baled and inventoried. Scrap 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 and southern 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. Washington reinstated a scrap tire fee but the funds are earmarked for stockpile abatement only.

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.

Figure 32 shows the scrap tire management trends in U.S. EPA Region X between 2003 and 2005.

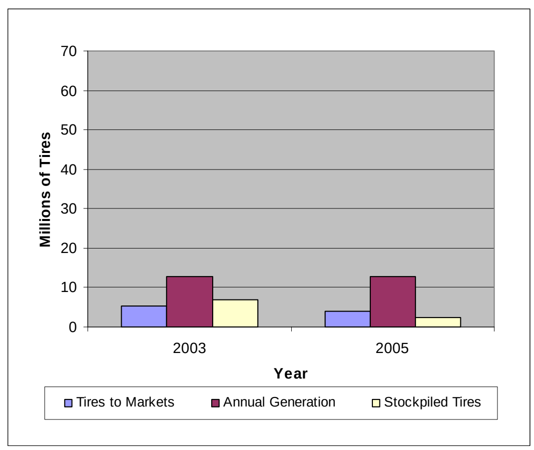

Figure 32: U.S. EPA Region X Comparative Scrap Tire Statistics, 2003 - 2005.

11

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 subcommittees 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 subcommittees focus on several areas, including: goals, TDF, rubber-modified asphalt, other ground rubber products, civil engineering applications and stockpiled tires. RMA participates in all of the RCC Subcommittees.

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.

Goals and Stockpile Reduction Subcommittee

Each RCC Tire Partnership Subcommittee has developed action plans to achieve its goals. The Goals and Stockpile Reduction Subcommittee developed the RCC Tire Partnership market and stockpile reduction goals stated earlier in this section. This subcommittee assisted RMA in the development of the state regulators questionnaire used to collect data for this report. Members of the subcommittee also called state regulators to encourage submittal of state scrap tire information.

The RCC Goals and Stockpile Reduction Subcommittee also continues to encourage stockpile abatement. The Subcommittee has promoted the new The Complete Scrap Tire Cleanup Guidebook developed by U.S. EPA Region V. The Subcommittee has coordinated workshops in states with large stockpiles to facilitate stockpile abatement, focusing on the 11 states identified in the 2003 RMA report as containing 90 percent of the remaining scrap tire stockpiles.

Ground Rubber Subcommittee

The Ground Rubber Subcommittee is focused on educating potential end-users of ground rubber products on the benefits of these products, compiling technical information and success stories, identifying and eliminating barriers to ground rubber markets and identifying "champions" for these markets.

Civil Engineering Subcommittee

The Civil Engineering Subcommittee is designed to "work with State, industry and Federal stakeholders to increase the usage of civil engineering applications for scrap tires." This Subcommittee has set several goals and targets and is working toward a 25 percent market share for civil engineering by 2008. The work of this Subcommittee focuses on various tasks associated with collecting case studies of successful projects and developing a web-based inventory of such projects and working to identify and eliminate barriers to these applications.

Rubberized Asphalt Subcommittee

The Rubberized Asphalt Subcommittee focuses on education and awareness, elimination of market barriers and identification of public sector champions for the market application.

The Subcommittee is working to develop technical materials and conduct education with public sector potential end-users of rubber modified asphalt. Currently, the Subcommittee is working to create a list of state demonstration projects and reported results, identify and address obstacles to the market, identify decision-makers in potential target public entities and promote this market application.

Tire-Derived Fuel Subcommittee

The Tire-Derived Fuel Subcommittee "supports the expanded and appropriate use of scrap tires" in TDF applications. The Subcommittee is working to collect comprehensive emissions sampling data to assist new TDF users and regulatory agencies. The Subcommittee also promotes the use of and identifies barriers to the use of TDF.

For more information about EPA efforts on scrap tires, please visit the EPA website at: http://www.epa.gov/epaoswer/non-hw/muncpl/tires/index.htm.

12

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 promulgate regulations. By 1990, all but two states (Alaska and Delaware) had promulgated regulations and/or developed a specific management program.

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.

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. Starting in 1993, ISTEA required that 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. The Federal Highway Administration (FHWA) issued a memo indicating 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 over-supply of ground rubber. In the period of 1994 to 1996, some 20 ground rubber operations were either sold or closed.

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’s Scrap Tire Management Council (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.

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. Several large and small-scale power plants had also begun using TDF.

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 at fully capacity, 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.

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. 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 one-half million being processed into ground rubber (three million tires were used in asphalt rubber applications and one and one-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.

The 2001 to 2003 timeframe was a period of continued expansion of the same major markets that expanded in the 1998 to 2001 timeframe. As a general statement, these markets expanded for the same reasons as in the last reported timeframe. This period also saw the emergence of the EAF market and creation of the U.S. EPA RCC.

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Conclusions

As this report details, in 2004 and 2005, scrap tire markets continued to increase overall, to an all-time high rate of nearly 87 percent. This period saw dramatic expansion in the TDF market, fueled by rising prices for traditional fuels. The growth in the TDF market, in turn, restricted growth in the civil engineering market, due to supply constraints in geographic regions where both market segments traditionally have been strong. The ground rubber market continues to expand, although this period saw the emergence of a new market leader in this segment – the sports surfacing market.

Scrap tire stockpile abatement progressed significantly as well in 2004 and 2005. Scrap tires in stockpiles are at an all-time low of 188 million tires. Several states have now completed ambitious stockpile abatement programs, while a few others have recently launched abatement activities. Other states, however, still need new emphasis and resource commitments in this area.

While this report delivers good and welcome news, the scrap tire industry and regulatory agencies collectively must maintain focus on this important issue. Markets, while strong, are constantly in flux. Stockpile abatement must continue and requires vigilance, resources and advocacy. Governmental programs, even those that are successful, must maintain emphasis on three core functions: market development, stockpile abatement and enforcement of regulations.

The Evolving Marketplace

By necessity, each of the biennial scrap tire market reports published by RMA is a snapshot in time. That view changes with time. The scrap tire industry must remain focused and flexible to change with the market. Here, the market is king, and the industry must keep up or risk falling behind.

Illustrations of these market dynamics in this edition are several. In the case of electric arc furnaces, this market did not expand with the vigor reported in the 2003 edition, due to realities in the steel manufacturing industry and intellectual property constraints. TDF markets saw enormous growth, but the market share of processed TDF to whole tire TDF shifted, changing the balance of that market and modifying the economics and processing requirements of TDF. Likewise, due to the expansion in TDF markets, civil engineering markets contracted slightly. For the first time, the market saw supply constraints on processed tire material. This development itself is significant and requires fresh thinking about transportation issues in order to sustain both of these markets. In the ground rubber area, the emergence of sports surfacing as the dominant market force required ground rubber producers to adjust targeted end-users and processing requirements.

These examples are not dispositive in and of themselves. On the contrary, they merely illustrate the dynamic nature of this market and underscore that in order for scrap tire markets to remain sustainable, those involved must be nimble.

The Stockpile Challenge

Significant achievements in stockpile reduction have occurred since 1990. Yet, significant as well is the fact that 188 million scrap tires remain in stockpiles across this country. As is often the case, incremental progress becomes more challenging in many states as the major, easily-accessible stockpiles are abated.

What remains in many states are smaller, harder to reach piles in rivers, ravines, over cliffs, buried, or on private property where access is denied. These stockpiles require creativity, time and more resources per tire to abate. Interestingly, large stockpiles garner more attention and public interest, so often funds for larger stockpiles are more successfully obtained. Abatement of smaller stockpiles often requires dedication of state regulators and other stakeholders.

Also, as states become more engaged in scrap tire management and stockpile abatement, new stockpiles are often discovered. Likewise, the size of known stockpiles is reassessed, causing stockpile size estimates to grow or contract. Technology also assists in this process – stockpile mapping using satellite imagery is gaining popularity as a tool to identify previously unknown stockpiles. These factors make assessing the magnitude of the stockpile challenge difficult and funding abatement to its completion equally so.

Large stockpiles do remain in some states where attention is lacking and resources are scarce. In these states, RMA continues to advocate for stockpile abatement and market creation. Gone are the days when scrap tires were useless waste relegated to unsightly stockpiles. To the contrary, scrap tire stockpiles can and should be completely eliminated in this country. While markets do not now exist for all stockpiled tires, the stockpiles should be eliminated, sending all possible tires to markets and properly landfilling the remaining tires to eliminate the risks (fire, disease, vermin) posed by scrap tire stockpiles.

State Scrap Tire Program Maintenance

Several states now are in an enviable position where most or all annually-generated scrap tires enter end-use markets, and most or all scrap tire stockpiles have been abated. While it is tempting to declare victory and sunset successful state programs, to do so would invite new problems.

Even where the trio of market development, stockpile abatement and state regulations have successfully created a healthy and thriving scrap tire program, continued state oversight and enforcement is necessary. In these cases, a state may assess whether the state scrap tire program fee can be reduced and whether the program can be realigned to reflect the maturity of the scrap tire management system in the state. This analysis is necessary and is a key component of responsible management of a state program. Yet, it would be short-sighted to conclude in this analysis that the role of state government is not necessary when markets exist and stockpiles are abated.

States should continue to play a vital role in a mature and thriving state scrap tire market. Such states should maintain a basic funding level to enforce state regulations and avoid the potential reappearance of scrap tire stockpiles. The long-term success of the scrap tire industry will be a function of continued market infrastructure advances and vigilant state oversight, leadership and enforcement.

Outlook

The outlook for continued growth in scrap tire markets remains strong. Stockpile abatement is expected to continue, although not likely at the rate seen in 2004 and 2005, due to state resource and focus challenges.

RMA is optimistic about the continuing work by the U.S. EPA Resource Conservation Challenge Tires Partnership, but remains cautious about the challenges of translating good work and positive intentions into action. RMA encourages all stakeholders interested in scrap tire management issues to remain vigilant, focused and committed cooperatively to creating and promoting a sustainable scrap tire marketplace.

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Appendices

APPENDIX A: SCRAP TIRE MANAGEMENT TRENDS, 1990 - 2005

APPENDIX B: 2005 U.S. SCRAP TIRE MARKET DATA TABLES

APPENDIX C: TIRE-DERIVED FUEL USERS

APPENDIX A: U.S. Scrap Tire Management Summary, 1990 – 2005.

	1990	1992	1994	1996	1998	2001	2003	2005
Scrap Tire Generation:	**223**	**252**	**253**	**265**	**265**	**281**	**290**	**299**
Scrap Tire Recycled or Recovered:	**24.5**	**68.0**	**138.5**	**164.5**	**177.5**	**218.0**	**233.3**	**259.2**
Tire-derived fuel:								
cement kilns	*6.0*	*7.0*	*37.0*	*34.0*	*38.0*	*53.0*	*53.0*	*58.0*
pulp/paper	*13.0*	*14.0*	*27.0*	*26.0*	*20.0*	*19.0*	*26.0*	*39.0*
industrial boilers	*0.0*	*6.0*	*10.0*	*16.0*	*15.0*	*11.0*	*17.0*	*21.0*
utility boilers	*1.0*	*15.0*	*12.0*	*23.0*	*25.0*	*18.0*	*23.7*	*27.0*
dedicated TTE (tire to energy)	4.5	15.0	15.0	16.0	16.0	14.0	10.0	*10.0*
Total Fuel	**24.5**	**57.0**	**101.0**	**115.0**	**114.0**	**115.0**	**129.7**	**155.1**
Electric arc furnaces	N/A	N/A	N/A	N/A	N/A	N/A	**0.5**	**1.3**
Ground rubber	0.0	5.0	1.5	7.5	7.0	21.0	**18.2**	**30.1**
Rubber modified asphalt	N/A	N/A	3.0	5.0	8.0	12.0	**10.0**	**7.4**
Punched/stamped products	N/A	N/A	8.0	8.0	8.0	8.0	**6.5**	**6.1**
Civil engineering	N/A	5.0	9.0	10.0	20.0	40.0	**56.4**	**49.2**
Export			12.5	15.0	15.0	15.0	**9.0**	**6.9**
Agricultural use and miscellaneous	N/A	1.0	3.5	4.0	5.5	7.0	**3.0**	**3.0**
Percent of scrap tire usage	**11%**	**27%**	**55%**	**62%**	**67%**	**78%**	**80%**	**87%**
Total Scrap Tires in Stockpiles	**1000**	**1000**	**800**	**500**	**400**	**300**	**275**	**188**

** some numbers may not add due to rounding.*

APPENDIX B: U.S. Scrap Tire Market Data Tables

2005 U.S. SCRAP TIRE MARKET DATA (IN MILLIONS OF TIRES)

StateName	EPARegion	Electric Arc Furnace	Tire Derived Fuel	Civil Engineering	Ground Rubber	Exported	Punch/Stamp	Agricultural	TotalTiresToMkt[1]	Baled[2]	Land Disposed[3]	Stockpiles	Unknown[4]	Annual Generation	Market %[5]
Alabama	Region IV	0.32	17.78	DNR	DNR	DNR	DNR	DNR	18.10	DNR	2.5	18.00	-16.10	4.50	402.22
Alaska	Region X	DNR	0.00	DNR	DNR	DNR	DNR	DNR	0.00	DNR	0.6	DNR	0.00	0.60	0.00
Arizona	Region IX	0.00	0.00	0.00	2.50	DNR	DNR	0.00	2.50	0	1.5	DNR	1.90	5.90	42.37
Arkansas	Region VI	0.03	1.52	0.47	0.26	DNR	DNR	DNR	2.28	0.15	2.1	0.06	-1.61	2.92	78.08
California	Region IX	0.00	9.00	6.70	5.20	2.30	DNR	2.50	25.70	0	11.5	1.50	0.60	37.80	64.25
Colorado	Region VIII	0.00	1.00	0.00	0.60	DNR	DNR	0.00	1.60	0	0	40.00	3.00	4.60	34.78
Connecticut	Region I	0.00	10.00	0.00	0.00	DNR	0.00	0.00	10.00	0	0	20.00	-6.60	3.40	294.12
Delaware	Region III	0.00	0.00	0.77	unknown	DNR	0.00	0.00	0.77	N/A	0	2.50	0.01	0.78	98.72
Florida	Region IV	0.00	9.02	1.74	3.65	0.22	DNR	DNR	14.63	0	2.09	0.09	1.50	18.22	80.30
Georgia	Region IV	0.00	6.00	0.00	0.00	0.00	0.00	0.00	6.00	0	0	0.00	3.00	9.00	66.67
Hawaii	Region IX	DNR	0.24	DNR	DNR	DNR	DNR	DNR	0.24	DNR	0	0.38	0.65	0.89	26.97
Idaho	Region X	DNR	1.00	DNR	DNR	DNR	DNR	DNR	1.00	DNR	0	DNR	0.30	1.30	76.92
Illinois	Region V	0.00	5.27	0.00	DNR	1.00	3.00	DNR	9.27	0	0	0.20	3.73	13.00	71.31
Indiana	Region V	0.00	0.10	0.01	0.00	DNR	DNR	DNR	0.11	0	2	1.67	3.89	6.00	1.83
Iowa	Region VII	DNR	1.30	0.64	0.97	DNR	DNR	DNR	2.91	0	0.08	0.09	0.74	3.73	78.02
Kansas	Region VII	0.00	0.38	DNR	DNR	DNR	DNR	DNR	0.38	DNR	1	DNR	1.62	3.00	12.67
Kentucky	Region IV	DNR	0.75	DNR	DNR	DNR	DNR	DNR	0.75	DNR	0	DNR	3.25	4.00	18.75
Louisiana	Region VI	DNR	8	DNR	1	DNR	DNR	DNR	9	DNR	1	DNR	-4.50	4.5	200.00
Maine	Region I	0.00	6.39	2.04	DNR	DNR	DNR	DNR	8.43	0	0	0.20	-6.92	1.51	558.28
Maryland	Region III	0.00	1.30	0.01	2.00	DNR	DNR	0.00	3.31	0	0	1.55	1.67	4.98	66.47
Massachusetts	Region I	DNR	DNR	DNR	DNR	DNR	3.00	DNR	3.00	DNR	0	4.03	3.30	6.30	47.62
Michigan	Region V	DNR	17.00	1.25	DNR	DNR	DNR	DNR	18.25	DNR	0	10.58	-8.25	10.00	182.50
Minnesota	Region V	0.00	2.00	2.00	0.00	DNR	DNR	0.00	4.00	0	0	DNR	1.00	5.00	80.00
Mississippi	Region IV	0.02	1.89	0.00	2.00	0.00	0.00	0.00	3.91	0	0.27	0.00	-1.01	2.90	134.83
Missouri	Region VII	0.00	6.00	0.00	0.97	DNR	DNR	DNR	6.97	0	0.44	1.33	-1.61	5.80	120.17
Montana	Region VIII	DNR	0.00	0.09	DNR	DNR	DNR	DNR	0.09	0.27	0	0.50	0.54	0.90	10.00
Nebraska	Region VII	0.00	0.36	0.55	0.50	0.00	0.00	0.04	1.45	0.06	0.51	1.25	-0.13	1.89	76.72
Nevada	Region IX	DNR	0.00	DNR	DNR	DNR	DNR	DNR	0.00	0.02	1	DNR	0.66	1.68	0.00
New Hampshire	Region I	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0.00	1.30	1.30	0.00
New Jersey	Region II	0.00	0.00	DNR	1.00	DNR	DNR	DNR	1.00	0	0	1.25	7.40	8.40	11.90
New Mexico	Region VI	0.00	0.35	DNR	DNR	DNR	DNR	0.07	0.42	0.39	0.18	0.04	0.79	1.60	26.25
New York	Region II	0.22	3.00	3.00	3.00	DNR	DNR	DNR	9.22	0.06	0	37.00	8.50	17.78	51.86
North Carolina	Region IV	DNR	6.08	5.38	1.17	DNR	DNR	DNR	12.63	0	4.5	0.06	-8.53	8.60	146.86
North Dakota	Region VIII	0.00	0.02	0.14	0.00	0.00	0.00	0.04	0.20	2.67	0.44	3.56	-2.73	0.58	34.48
Ohio	Region V	DNR	1.34	9.38	0.88	0.05	0.13	DNR	11.78	0	1.57	3.56	-1.95	11.40	103.33
Oklahoma	Region VI	0.00	2.36	0.00	1.28	DNR	DNR	DNR	3.64	0	0.05	0.70	0.31	4.00	91.00
Oregon	Region X	DNR	0.50	DNR	1.00	DNR	DNR	DNR	1.50	DNR	0	DNR	2.14	3.64	41.21
Pennsylvania	Region III	0.00	0.75	0.85	6.00	0.30	DNR	0.00	7.90	0	0	7.89	4.50	12.40	63.71
Rhode Island	Region I	0.00	1.00	0.00	0.02	DNR	DNR	0.00	1.02	0	0	0.00	-0.02	1.00	102.00
South Carolina	Region IV	DNR	4.55	2.58	0.61	DNR	DNR	DNR	7.74	0	0	0.00	-0.48	7.26	106.61
South Dakota	Region VIII	DNR	1.99	DNR	DNR	DNR	DNR	DNR	1.99	DNR	0	0.00	-1.32	0.67	297.01
Tennessee	Region IV	0.75	3.50	DNR	DNR	DNR	DNR	DNR	4.25	DNR	0	0.30	1.65	5.90	72.03
Texas	Region VI	0.00	14.95	7.36	1.62	3.00	0.00	0.37	27.30	0.02	7.17	24.62	-13.16	21.33	127.99
Utah	Region VIII	0.00	1.47	0.00	0.50	DNR	DNR	0.00	1.97	0	0	0.05	1.14	3.11	63.34
Vermont	Region I	0.00	0.57	0.03	0.03	DNR	DNR	0.03	0.66	0	0	0.10	0.00	0.66	100.00
Virginia	Region III	0.00	1.77	4.23	0.71	0.00	0.00	0.00	6.71	0.02	0.05	2.22	0.01	6.79	98.82
Washington	Region X	DNR	1.37	DNR	DNR	DNR	DNR	DNR	1.37	DNR	1.36	2.50	4.45	7.18	19.08
West Virginia	Region III	DNR	1.00	DNR	DNR	DNR	DNR	DNR	1.00	DNR	0	DNR	4.50	5.50	18.18
Wisconsin	Region V	DNR	2.22	DNR	DNR	DNR	DNR	DNR	2.22	DNR	0	0.60	2.22	4.44	50.00
Wyoming	Region VIII	DNR	DNR	DNR	DNR	DNR	DNR	DNR	0.00	DNR	0.51	DNR	0.00	0.51	0.00
TOTALS		1.34	155.09	49.22	37.47	6.87	6.13	3.05	259.17	3.66	42.42	188.38	-4.65	299.15	86.64

Footnotes

[1]Total of tires consumed in electric arc furnaces, tire derived fuel, civil engineering, ground rubber, export, punch/stamp and agricultural markets.

[2]"Baled" is not included in the total tires to market calculation, because the vast majority of the tire bales were not consumed in markets. In the case of Texas, the tires were consumed in civil engineering applications and are included in the civil engineering values.

[3]"Land disposed" includes tires that were landfilled, monofilled or used in reclamation projects.

[4]"Unknown" is the difference between the annual generation and the sum of the total tires to market, baled and land disposed.

[5]"Market %" is the "TotalTiresToMkt" over "Annual Generation."

2005 U.S. SCRAP TIRE MARKET DATA (IN THOUSANDS OF TONS)

StateName	EPARegion	Derived Fuel	Civil Engineering	Ground Rubber	Electric Arc Furnace	Exported	Punch/Stamp	Agricultural	TotalTiresToMkt[1]	Baled[2]	Land Disposed[3]	Stockpiles	Unknown[4]	Annual Generation	Market %[5]
Alabama	Region IV	200	DNR	DNR	3.6	DNR	DNR	DNR	203.6	DNR	41.25	297	-170.60	74.25	274.21
Alaska	Region X	0	DNR	DNR	DNR	DNR	DNR	DNR	0	DNR	9.9	DNR	0.00	9.9	0
Arizona	Region IX	0	0	41.25	0	DNR	DNR	0	41.25	0	24.75	DNR	31.35	97.35	42.37
Arkansas	Region VI	17.14	5.3	2.9	0.29	DNR	DNR	DNR	25.63	2.53	23.56	1.06	-3.50	48.22	53.15
California	Region IX	148.5	110.55	85.8	0	37.95	DNR	41.25	424.05	0	189.75	24.75	9.90	623.7	67.99
Colorado	Region VIII	16.5	0	9.9	0	DNR	DNR	0	26.4	0	0	660	49.50	75.9	34.78
Connecticut	Region I	165	0	0	0	DNR	0	0	165	0	0	330	-108.90	56.1	294.12
Delaware	Region III	0	8.62	unknown	0	.	0	0	8.62	N/A	0	41.25	4.31	12.93	66.67
Florida	Region IV	101.5	19.6	41.1	0	2.5	DNR	DNR	164.7	0	23.46	1.41	16.84	205	80.34
Georgia	Region IV	99	0	0	0	0	0	0	99	0	0	0	49.50	148.5	66.67
Hawaii	Region IX	2.69	DNR	DNR	DNR	DNR	DNR	DNR	2.69	DNR	0	4.3	7.31	10	26.9
Idaho	Region X	16.5	DNR	DNR	DNR	DNR	DNR	DNR	16.5	DNR	0	DNR	4.95	21.45	76.92
Illinois	Region V	59.32	0	DNR	0	16.5	49.5	DNR	125.32	0	0	3.3	89.18	214.5	58.42
Indiana	Region V	1.11	0.11	0.01	0	DNR	DNR	DNR	1.23	0	33	18.75	64.77	99	1.24
Iowa	Region VII	14.65	7.18	10.87	DNR	DNR	DNR	DNR	32.7	0	0.94	1	8.36	42	77.86
Kansas	Region VII	4.27	DNR	DNR	0	DNR	DNR	DNR	4.27	DNR	16.5	DNR	28.73	49.5	8.63
Kentucky	Region IV	8.42	DNR	DNR	DNR	DNR	DNR	DNR	8.42	DNR	0	DNR	57.58	66	12.76
Louisiana	Region VI	132	DNR	16.5	DNR	DNR	DNR	DNR	148.5	DNR	16.5	DNR	-90.75	74.25	200
Maine	Region I	71.89	23	DNR	0	DNR	DNR	DNR	94.89	0	0	2.3	-77.89	17	558.18
Maryland	Region III	21.45	0.08	33	0	DNR	DNR	0	54.53	0	0	25.58	1.47	56	97.38
Massachusetts	Region I	DNR	DNR	DNR	DNR	DNR	49.5	DNR	49.5	DNR	0	66.46	54.45	103.95	47.62
Michigan	Region V	280.5	20.63	DNR	DNR	DNR	DNR	DNR	301.13	DNR	0	119	-136.13	165	182.5
Minnesota	Region V	33	33	0	0	DNR	DNR	0	66	0	0	DNR	16.50	82.5	80
Mississippi	Region IV	21.27	0	33	0.18	0	0.01	0	54.46	0	3.06	0.03	-6.61	47.85	113.81
Missouri	Region VII	99	0	10.92	0	DNR	DNR	DNR	109.92	0	5	15	-19.22	95.7	114.86
Montana	Region VIII	0	1	DNR	DNR	DNR	DNR	DNR	1	3	0	8.25	10.85	14.85	6.73
Nebraska	Region VII	4.09	6.18	5.64	0	0	0	0.45	16.36	0.63	5.71	20.59	8.45	31.15	52.52
Nevada	Region IX	0	DNR	DNR	DNR	DNR	DNR	DNR	0	0.25	16.5	DNR	10.95	27.7	0
New Hampshire	Region I	0	0	0	0	0	0	0	0	0	0	0	21.45	21.45	0
New Jersey	Region II	0	DNR	16.5	0	DNR	DNR	DNR	16.5	0	0	20.63	122.10	138.6	11.9
New Mexico	Region VI	3.97	DNR	DNR	0	DNR	DNR	0.8	4.77	4.35	1.97	0.5	8.88	18	26.5
New York	Region II	49.5	49.5	49.5	2.43	DNR	DNR	DNR	150.93	0.99	0	610.5	48.08	200	75.47
North Carolina	Region IV	68.39	60.5	13.21	DNR	DNR	DNR	DNR	142.1	0	50.57	0.95	-50.77	141.9	100.14
North Dakota	Region VIII	0.2	1.58	0	0	0	0.01	0.4	2.19	30	5	40	-30.69	6.5	33.69
Ohio	Region V	15.07	105.5	9.89	DNR	0.59	1.48	DNR	132.53	0	17.65	40	37.92	188.1	70.46
Oklahoma	Region VI	26.5	0.02	14.4	0	DNR	DNR	DNR	40.92	0	0.74	11.55	24.34	66	62
Oregon	Region X	8.25	DNR	16.5	DNR	DNR	DNR	DNR	24.75	DNR	0	DNR	35.31	60.06	41.21
Pennsylvania	Region III	12.38	14.03	99	0	4.95	DNR	0	130.36	0	0	130.19	74.24	204.6	63.71
Rhode Island	Region I	16.5	0	0.33	0	DNR	DNR	0	16.83	0	0	0	-0.33	16.5	102
South Carolina	Region IV	75.04	42.62	10	DNR	DNR	DNR	DNR	127.66	0	0	0	-45.94	81.72	156.22
South Dakota	Region VIII	22.34	DNR	DNR	DNR	DNR	DNR	DNR	22.34	DNR	0	0	-14.84	7.5	297.87
Tennessee	Region IV	57.75	DNR	DNR	12.38	DNR	DNR	DNR	70.13	DNR	0	4.95	27.22	97.35	72.04
Texas	Region VI	168.23	82.81	18.18	0	49.5	0.01	4.15	322.88	0.25	80.73	276.98	-163.86	240	134.53
Utah	Region VIII	16.57	0	5.58	0	DNR	DNR	0	22.15	0	0	0.83	12.86	35.01	63.27
Vermont	Region I	9.34	0.54	0.54	0	DNR	DNR	0.54	10.96	0	0	1.65	-0.07	10.89	100.64
Virginia	Region III	19.91	47.64	7.99	0	0	0	0	75.54	0.22	0.62	25	0.00	76.38	98.9
Washington	Region X	15.4	DNR	DNR	DNR	DNR	DNR	DNR	15.4	DNR	15.25	41.25	50.12	80.77	19.07
West Virginia	Region III	16.5	DNR	DNR	DNR	DNR	DNR	DNR	16.5	DNR	0	DNR	74.25	90.75	18.18
Wisconsin	Region V	25	DNR	DNR	DNR	DNR	DNR	DNR	25	DNR	0	9.9	25.00	50	50
Wyoming	Region VIII	DNR	DNR	DNR	DNR	DNR	DNR	DNR	0	DNR	8.4	DNR	0.00	8.4	0
TOTALS		2144.64	639.99	552.51	18.88	111.99	100.51	47.59	3616.11	42.22	590.81	2854.91	166.62	4410.73	82.0%

Footnotes

[1]Total of tires consumed in electric arc furnaces, tire derived fuel, civil engineering, ground rubber, export, punch/stamp and agricultural markets.

[2]"Baled" is not included in the total tires to market calculation, because the vast majority of the tire bales were not consumed in markets. In the case of Texas, the tires were consumed in civil engineering applications and are included in the civil engineering values.

[3]"Land disposed" includes tires that were landfilled, monofilled or used in reclamation projects.

[4]"Unknown" is the difference between the annual generation and the sum of the total tires to market, baled and land disposed.

[5]"Market %" is the "TotalTiresToMkt" over "Annual Generation."

APPENDIX C: Tire-Derived Fuel Users

Company	*Location*	*Type of Facility*
	ALABAMA	
Lafarge North America	Calera	Cement kiln
International Paper Corp.	Courtland	Pulp & paper mill
Holcim Inc.	Theodore	Cement Kiln
Lehigh Cement Company		Cement Kiln
National Cement	Ragland	Cement kiln
Smurfit-Stone Container Enterprises, Inc.	Stevenson	Pulp & paper mill
CEMEX	Demopolis	Cement kiln
	ARKANSAS	
Ash Grove Cement Company	Foreman	Cement kiln
Georgia Pacific	Crossett	Pulp & paper mill
Domtar, Inc.	Ashdown	Pulp & paper mill
International Paper	Pine Bluff	Pulp & paper mill
	CALIFORNIA	
California Portland Cement	Ontario	Cement kiln
CEMEX	Victorville	Cement Kiln
Lehigh Southwest	Redding	Cement Kiln
Stockton Co-generation	Stockton	Industrial boiler
Mitsubishi Cement	Lucerne Valley	Cement kiln
National Cement Co. of CA	Lebec	Cement kiln
Port Stockton District Energy Facility		Utility Boiler
Mt. Posco Cogeneration	Kern County	Industrial boiler
	COLORADO	
Holcim, Inc.	Florence	Cement kiln
	CONNECTICUT	
Exeter Energy	Sterling	Dedicated tire-to-energy
	FLORIDA	
Ridge Generating Station	Auburndale	Utility boiler
CEMEX	Brooksville mid 2006	Cement kiln
Rinker Materials	Brooksville	Cement kiln
Florida Rock	Gainesville	Cement kiln
Names not supplied	Across the state	Waste-to-energy (6)
	GEORGIA	
CEMEX	Clinchfield	Cement Kiln
Georgia Pacific	Brunswick	Pulp & paper mill
Inland-Rome	Rome	Pulp & paper mill
Interstate Paper	Riceborough	Pulp & paper mill
SP NEWSPRINT CO	Dublin	Pulp & paper mill
	HAWAII	
AES Hawaii, Inc.	Oahu	Industrial boiler
	IOWA	
Holcim, Inc.	Mason City	Cement kiln
	IDAHO	
Ash Grove Cement Company	Inkom	Cement kiln
Cascade	Boise	Pulp & Paper Mill
	ILLINOIS	
Archer Daniels Midland (ADM)	Decatur	Industrial boiler
Buzzi Unichem USA	Oglesby	Cement kiln
Illinois Power	Baldwin	Utility Boiler
Lafarge North America	Grand Chain/Joppa	Cement kiln
	KANSAS	
Ash Grove Cement Company	Chanute	Cement kiln
Monarch Cement	Humboldt	Cement kiln
	KENTUCKY	
Owensboro Municipal Utilities	Owensboro	Utility boiler
East Kentucky Power	Maysville	Utility Boiler
NewPage Corporation	Wickliffe	Pulp & Paper Mill
	LOUISIANA	
International Paper	Mansfield	Pulp & paper mill
International Paper	Bastrop	Pulp & paper mill
Boise	Deridder	Pulp & paper mill
	MARYLAND	
Essroc Cement Company	Joppa	Cement Kiln
St. Lawrence Cement Co.	Hagerstown	Cement kiln
Essroc Cement Company		Lime kiln
Fort Detrick	Fredrick	Industrial boiler
	MAINE	
NewPage Corporation	Rumford	Pulp & paper mill
International Paper	Bucksport	Pulp & paper mill
Georgia-Pacific	Woodland	Pulp & paper mill
	MICHIGAN	
American Resource Recovery Corp.	Monroe	Industrial boiler
Hillman Power	Hillman	Utility boiler
Viking Energy	McBain	Utility boiler
Viking Energy	Lincoln	Utility boiler
Holcim, Inc.	Dundee	Cement kiln
Wyandotte Power	Wyandotte	Utility boiler
Tondu Energy	Filer City	Utility boiler
Grayling Generating Station	Grayling	Industrial boiler
	MISSOURI	

Company	*Location*	*Type of Facility*
Holcim, Inc.	Clarksville	Cement kiln
Ameren/UE, Inc.	Portage Des Sioux	Utility boiler
University of Missouri-Columbia	Columbia	Industrial boiler
Aquila/ Sibley Generating Station	Kansas City	Utility boiler
Buzzi Unichem USA	Cape Girardeau	Cement kiln
Empire District Electric Co. Asbury Power Plant	Joplin	Utility boiler
Aquila, Inc. -	St. Joseph	Utility boiler
	MISSISSIPPI	
Nucor Steel	Jackson	EAF
	NEW YORK	
Nucor Steel Auburn	Auburn	Electric Arc Furnace
Black River Electric	Fort Drum	Utility boiler
WPS Empire State	Niagara Falls	Industrial boiler
	NORTH CAROLINA	
Cogentrix	Roxboro	Industrial Boiler
Cogentrix	Southport	Industrial Boiler
Cogentrix	Lumberton	Industrial Boiler
	OHIO	
Akron Thermal, LLP (utility)	Akron	Utility boiler
NewPage Corporation	Chillicothe	Pulp & paper mill
	OKLAHOMA	
Holcim, Inc.	Ada	Cement kiln
Lafarge North America	Tulsa	Cement kiln
Buzzi Unichem USA	Pryor	Cement kiln
	OREGON	
Ash Grove Cement Company	Durkee	Cement kiln
	PENNSYLVANIA	
Allentown Cement	Blandon	Cement kiln
Lafarge North America	Whitehall	Cement kiln
ESSROC Materials	Meadville	Cement kiln
	SOUTH CAROLINA	
Trigen Biopower	Hodges	Industrial boiler
Lafarge North America	Harleyville	Cement kiln
Bowater	Catawba	Pulp & paper mill
Sonoco Products Company	Hartsville	Pulp & paper mill
International Paper	Eastover	Pulp & paper mill
International Paper	Georgetown	Pulp & paper mill
	TENNESSEE	
Bowater Incorporated	Calhoun	Pulp & Paper Mill
Allen Steam Plant	Memphis	Utility Boiler
CEMEX	Knoxville	Cement Kiln
Gerdau Ameristeel	Jackson	EAF
	TEXAS	
Ashgrove Cement	Midlothian	Cement kiln
Capital Cement	San Antonio	Cement kiln
CEMEX	New Braunfels	Cement kiln
CEMEX /Southdown Cement	Odessa	Cement kiln
Holcim Cement	Midlothian	Cement kiln
Lone Star Cement	Mary Neal	Cement kiln
Texas Lehigh Cement	Buda	Cement kiln
Texas Industries Cement	New Braunfels	Cement kiln
	UTAH	
Ashgrove	Leamington	Cement Kiln
Holcim Inc.	Morgan	Cement kiln
Chemical Lime Company	Grantsville	Lime kiln
	VIRGINIA	
Cogentrix	Richmond	Industrial boiler
Southeastern Public Service Authority	Portsmouth	Industrial boiler
Tire Energy Corp (TEC)	Martinsville	Industrial boiler
	WASHINGTON	
Ashgrove Cement	Seattle	Cement Kiln
	WEST VIRGINIA	
Allegeny Power	Parkersburg	Utility Boiler
	WISCONSIN	
Alliant Energy	Cassville	Utility Boiler
Alliant Energy Edgewater Generating Station	Sheboygan	Utility Boiler
Thilmany Papers	De Pere	Pulp & Paper Mill
Xcel Energy Bayfront Plant	Ashland	Utility Boiler
University of Wisconsin Charter Street Plant	Madison	Industrial Boiler

RUBBER manufacturers association

1400 K Street, NW
Washington, DC 20005
tel (202) 682-4800
fax (202) 682-4854
http://www.rma.org/scrap_tires/