SCRAP TIRE MARKETS IN THE UNITED STATES

9th BIENNIAL REPORT

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About the Rubber Manufacturers Association

The Rubber Manufacturers Association (RMA) is the national trade association in the U.S. for the rubber products manufacturing industry representing nearly 100 companies that manufacture various rubber products. These member companies include every major domestic tire manufacturer including: Bridgestone Americas, Inc., Continental Tire N.A.; Cooper Tire & Rubber Company; The Goodyear Tire & 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.

Executive Summary

This report is the ninth in a series of biennial reports analyzing the state of scrap tire management in the United States. From the first to the seventh biennial reports scrap tire market, generation and stockpile data were provided only in "millions of tires." In the eighth report, RMA provided data in "millions of tires'" and for the first time provided market information by "weight," in thousands of tons to reflect the evolving nature of the scrap tire industry. Increasingly, the scrap tire industry reports sales and usage in weight. This report completes the transition from unit-based to weight-based reporting. The data provided here are expressed in terms of weight only, in thousands of tons. It is important to note that RMA uses 2005 weight-based conversions for comparison to 2007 data, but will not be converting older historical data to weight. Trends in this report are shown 1990 – 2005 using units and 2005 – 2007 using weight.

Market Overview

In 2007, 89.3% percent of the scrap tires generated in the U.S. by weight were consumed in end-use markets. The total volume of scrap tires consumed in end-use markets in the U.S. reached approximately 4105.8 thousand tons of tires. RMA estimates that about 4595.7 thousand tons of tires were generated in the U.S. in 2007. By comparison, in 2005, about 82 percent of tires were consumed by weight. In 1990, only eleven percent of tires were consumed on a per tire basis.

It should be noted that the percentage of scrap tires consumed by markets increased 13.5 percent, while the volume of tires utilized increased by about 489.7 thousand tons. The market percentage is affected not only by the volume of scrap tires consumed but also by the volume of scrap tires generated. The scrap tire generation rate has steadily increased along with the population in the United States, which tempers the increase in market percentage. This has been a consistent trend since RMA began to chronicle scrap tire markets in 1990.

However, the recent global economic downturn has caused a decrease in total vehicle miles traveled in the United States, as well as a contraction in U.S. new replacement tire market. Both of these factors suggest a decrease in the rate of scrap tire generation, which will be a factor in need of assessment in the 10th edition of this study. Just as the economic downturn likely is a temporary condition, so too are the resulting decreases in U.S. vehicle miles traveled, replacement tire shipments and scrap tire generation. In the long term, the need to expand all economically viable and environmentally sound markets for scrap tires is still an imperative.

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 the remaining annually-generated tires, which indicates that new stockpile production should be negligible.

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 2484.4 thousand tons of scrap tires in the U.S. in 2007, or about 54 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 strong demand for the next two years

Ground Rubber Applications

This market consumed 789.1 thousand tons of scrap tires, or about 17 percent of the volume of scrap tires generated. Ground rubber applications include new rubber products, playground and other sports surfacing and rubber-modified asphalt. The sports surfacing market remained the most dynamic segment in the ground rubber market during this period. 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.

Civil Engineering

The civil engineering market consumed 561.6 thousand tons of tires in 2007, about 12 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 continued decrease since from its peak in 2003, due to competition from TDF markets.

Stockpile Abatement

At the end of 2007, about 128 million scrap tires remained in stockpiles in the United States, a reduction of over 87 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: Alabama, Arizona, Colorado, Massachusetts, Michigan, New York and Texas. These states contain over 85 percent of the scrap tires remaining in stockpiles. Of these states, Alabama, Michigan and New York have ongoing abatement programs. Texas completed an abatement effort in 2007. RMA continues to work with legislators and regulators in these states to develop and implement effective scrap tire programs to address these stockpiles.

Regional Markets

In this report, RMA analyzed regional scrap tire management and market trends by U.S. EPA Region. Scrap tire markets remain regional in nature. Scrap tire markets remain strong in the New England region, while the mid Atlantic region is gaining strength. Market demand in the Southeast remains high, fueled by expanding TDF and ground rubber markets.

The demand for tire-derived products in the Midwest and Upper Midwest, combined with expanding markets in the Eastern Plains states now creates a virtual sold-out condition in an area of the country that stretches from Texas to Minnesota and eastwards. Consequently, the demand for scrap tires equals or exceeds the supply of scrap tires exist in approximately three-fifths of the country.

In the Western portion of the country, markets still remained challenged by geography and population – large expanses of land separate population centers, thus complicating transportation of scrap tires to available potential markets. Over the last two years, end-use markets expanded, dramatically increasing demand for tire-derived materials in the Pacific Northwest and the Rocky Mountain regions. This trend has caused scrap tires to be transported from states with limited or no markets to states that have newly developed markets (e.g., California and Utah). Several of the Mountain states still remain without viable markets but ample landfill capacity.

Outlook

Scrap tire management in the U.S. has made considerable progress since the last biennial report. In 2007, more scrap tires were consumed in markets than ever before, thus avoiding landfills and stockpiles.

Two of the major markets for scrap tires in the U.S. – TDF and ground rubber applications – are expected to expand in the 2008 – 2010 timeframe.

Scrap tires in stockpiles have been reduced by over 87 percent since 1990. However, challenges remain. Several states still lack effective state scrap tire management programs. Some states with comprehensive programs are facing the loss of scrap tire funds, due to state budget shortfalls during the economic downturn. 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 ninth 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 2007, 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.

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 a majority of state scrap tire regulators and extensive phone interviews with scrap tire processors and others involved in scrap tire management activities across the United States.

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. There is also a new phenomenon in the industry: the market in a post-stockpile marketplace. The lack of additional supply in certain regions has had an impact on market dynamics, which will be further discussed in the body of this report.

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 recycling 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.

With ever increasing demand for scrap tires, an increasingly popular school of thought is that the disposal fee paid by consumers or retailers should be decreasing. Increasing demand for a negatively valued material should decrease the negative value. While standard economic theory would normally support this concept, the market reality is different.

The fees that consumers typically pay the retailer differ from the amount the retailer pays the service provider that removes tires from their retail outlet. The amount paid to the service provider for removing scrap tires is impacted by the costs of transportation, primarily fuel costs. Furthermore, with the current economic situation, the driving public is waiting longer to replace their worn tires. This has caused a decrease in the number of tires that scrap tire haulers can cull from scrap tires collected for potential resale as used tires. The resulting used tires have traditionally been a steady stream of income for the scrap tire collection service provider. Consequently, it seems unlikely that there will be a general decrease in the scrap tire service fees in the near-term.

On the other hand, tires abated from stockpiles can be dirty and difficult to process. If the 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[1], an initiative focusing on scrap tire issues, RMA developed and sent a questionnaire to all state scrap tire regulators. Responses to this questionnaire provided the basis for some of the market data and all of the stockpile inventory data and analyses contained in this report. RMA received responses from a majority of states. Also, RMA collected updated information about state scrap tire programs, which is provided at Appendix E of this report.

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 market data supplied in questionnaire responses. 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 through 2005, 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

[1] The EPA Resource Conservation Challenge (RCC) as a voluntary national designed 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 Tires Partnership, started in 2002, 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.

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.

In preparation for the publication of the 8th biennial report (2005 data), 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 starting with the 2005 data collection effort, RMA should collect scrap tire market data from states in terms of both weights and units for this report.

In 2005 and 2007, RMA solicited data from states in the form accessible to the individual state, whether it was in terms of weight (tons), passenger tire equivalents or number of tires (units). The scope of this report, as well as the previous edition, is limited to those tires DOT-certified for on-road use.

It is important to note that this report's data based on weight may not be directly comparable to the previous data collected based on units. In the 8th edition, RMA reported the data in terms of both weight (thousands of tons) and units (millions of tires) to provide a reference conversion for the data.

With this 9th edition, RMA completes the conversion to a weight-based approach. Market data in this report are only provided in weight – thousands of tons. This transition makes direct comparisons to previous years challenging. RMA is not going to convert all of the previous reports' unit-based market and generation figures to weights. Instead, the 2005 data and analysis will serve as the bridge between the old and new reporting systems.

Figure 1 illustrates how 2005 data will be used for this purpose. Historic trends shown in this report capture the periods 1990 – 2005 and 2005 – 2007 but not cumulatively 1990 – 2007.

In the interest of greater consistency and precision of data, however, we feel 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.

2005 Data	Millions of Tires	Converted to	Tons x 10^3
Tire-derived fuel	155.1	➡	552.5
Civil Engineering	49.2	➡	640.0
Ground Rubber	37.5	➡	552.5
Electric Arc Furnace	1.3	➡	18.9
Exported	6.9	➡	112.0
Punch/Stamp	6.1	➡	100.5
Agricultural	3.1	➡	47.6
Total Tires to Market	259.2	➡	3616.1
Land disposed	42.4	➡	590.8
Annual Generation	299.2	➡	4410.7
% to Markets	86.7%	➡	82.0%

Figure 1: Illustration of Unit-Based to Weight-Based Scrap Tire Data Reporting

The exception to the weight-based conversion is stockpiled tires. Stockpile estimates continue to be predominately provided in terms of millions of tires. In an effort to report primary data where possible, data on scrap tire remaining stockpiles will continue to be reported in terms of millions of tires. This allows analysis of historical trends and progress towards eliminating scrap tire stockpiles from 1990 through 2007.

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 120 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.

As illustrated in Table 1, the average tire weight in the United States across all on-road tire categories and classes is 37.1 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, 37 pounds was used to represent the average weight of a scrap tire.

Tire Class	Millions of Tires	Market %	Weight (lbs)
Light Duty Tires	**257.8**	**85.03%**	**22.5**
Passenger tire replacements [1]	*196.2*	*64.70%*	
Light truck tire replacements [1]	*33.6*	*11.08%*	
Tires from scrapped Cars [2]	*28.0*	*9.24%*	
Commercial Tires	**45.4**	**14.97%**	**120**
Medium, wide base, heavy truck replacement tires [1]	*16.9*	*5.57%*	
Tires from scrapped trucks and buses [2]	*28.5*	*9.40%*	
Total scrapped tires	**303.2**	**100.0%**	**37.1**
[1] 2005 RMA Tire Industry Facts, Factbook 2007. Industry total replacement tire shipments.			
[2] Ward's Motor Vehicle Facts and Figures, 2008. Includes the number of vehicles removed from service in the car/light truck, truck and bus categories in 2007. Assumes 4 tires scrapped from light duty vehicles and 5 tires scrapped from trucks and buses.			

Table 1: Average Tire Weight Calculations, 2007.

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 sizes for new tires, and consequently scrap tires, 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, consistent with the value reported in the 8th Biennial Report. RMA recommends that this value continue to be used as the revised standard PTE value in the United States.

Normalizing 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 several 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 “thousands of tons” (weights).

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 were converted to thousands of tons using 37 pounds for the weight of a tire. If a state provided data in terms of PTEs, the data were converted to thousands of tons using the PTE value provided by the reporting state. If the state did not specify the PTE value it used, RMA used a PTE value of 22.5 pounds to convert the PTE data to thousands of tons.

Scrap Tire Generation Rates

RMA estimates that about 4595.7 thousand tons of scrap tires were discarded in 2007, 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 2.

2007 RMA total industry replacement tire data were used. The 2007 U.S. population estimate by the U.S. Census Bureau was used to reflect the total U.S. population. Table 2 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.

In its scrap tire questionnaire sent to the states, RMA asked states to report the number of scrap tires generated annually. Some states provided RMA with generation data based on state calculations or assumptions, others used the one tire per year maxim and others did not provide generation data. In the cases where states did not provide generation data, RMA used the state population estimate to calculate annual scrap tire generation. The data provided millions of tires or passenger tire equivalents were converted to weight (thousands of tons) as described above.

Passenger tire replacements[2]	196.20
Light truck tire replacements[2]	33.60
Medium, wide base, heavy truck replacement tires[2]	16.90
Tires from scrapped cars[3]	28.03
Tires from scrapped trucks and buses	28.50
Total scrapped tires	303.23
U.S. population – 2007 U.S. Census estimate (July 1, 2007)[4]	301.29
Number of tires scrapped per person	1.01
[1] All units represented in table are in millions, except for the number of tires per person, which is in actual units.	
[2] 2007 RMA Tire Industry Facts, Factbook 2008. Industry total replacement tire shipments.	
[3] Ward's Motor Vehicle Facts and Figures, 2008 Includes the number of vehicles removed from service in the car/light truck, truck and bus categories in 2008. Assumes 4 tires scrapped from light duty vehicles and 5 tires scrapped from trucks and buses.	
[4] Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2000 to July 1, 2008 (NST-EST2008-01), accessed at http://www.census.gov/popest/states/NST-ann-est.html on April 15, 2009.	

Table 2: Scrap Tire Generation as a Function of U.S. Population[1]

Adjusting Tire-Derived Fuel Data

In this and the previous two reports, RMA has endeavored to improve the data quality, accuracy and precision of the scrap tire market data it reports. Likewise, several states have improved scrap tire market data collection and reporting processes. Along with these efforts, however, new challenges have been created.

In particular, as RMA and the states have received more precise tire-derived fuel data, it has become apparent that a shift has occurred in the type of data received. In previous reporting cycles, RMA would collect estimates of the total number of tires (in millions) that were being diverted to the tire derived fuel market.

In contrast, the tire-derived fuel market data collected for this report reflect the volume of tire-derived fuel *consumed* by industrial and other facilities. In the case of cement kilns, the two types of data are synonymous, since the vast majority of cement kilns consume whole tire TDF.

However, in the case of other TDF users, including pulp and paper mills, electric utilities and industrial boilers, the two types of reporting structures produce different data, since these facilities use a processed TDF chip. The result is that the facility usage-based data under reports the total volume of scrap tires diverted to TDF markets by the volume of tire material removed during processing to produce the TDF chip.

As a consequence, in this report RMA has adjusted the TDF data provided for processed TDF markets to reflect the total volume of scrap tires diverted to this market. For cement kiln markets, no adjustment factor was applied. For pulp and paper mill, electric utility and industrial boilers, RMA adjusted the TDF data reported by a factor of 1.25 to account for the tire material removed during TDF processing.[2] For transparency, RMA has also provided the original reported data but all market percentage and benchmarking analyses are based on the RMA adjusted data.

Initial consultation with industry experts indicates that this adjustment factor is conservative and does not overestimate the amount of tire mass lost during processing. RMA plans to investigate the issue of processing volume loss for publication in the 10th market report

[2] RMA did not apply this adjustment factor to data supplied by Florida, because RMA confirmed that such an adjustment had already been made to the data provided by Florida.

through interviews and data collection from industry sources. Further, RMA plans to attempt to collect data about secondary markets for the tire material removed during TDF chip processing (mainly wire and fluff, with some agglomerated rubber). Depending on the availability of this type of data, RMA will endeavor to publish aggregate data in this area in the 10th report.

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 15.6 million retreadable tire casings were retreaded in the U.S. in 2006 and used by commercial aircraft, commercial trucks, school buses and off-the-road vehicles such as industrial, agricultural and mining equipment. Data for 2007 and later are unavailable due to recent consolidation in the retreading industry. 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 have not yet reached the end of their serviceable life. 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. However, in the cement industry, even though the iron in the tire replaces virgin iron requirements, the tires provide significant BTU value replacing some need for traditional fuels.

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

Considerable changes were observed in the markets and market infrastructure for scrap tires in the period between 2005 and 2007. The total number of scrap tires going to a market annually increased to 132.6 thousand tons in 2007 (about 89 percent of the 9.3 thousand tons generated) up from 3,616.1 thousand tons in 2005 (82 percent of the 4,410.7 thousand tons generated).

The increased utilization of scrap tires can be attributed to four factors: the continued elevated cost of energy, which continues to expand the demand for TDF; the expansion of the mulch market, the continuation of strong demand for playground cover and the continued growth of the use of ground rubber as an infill material for synthetic sport surfacing.

Table 3 shows the estimated total U.S. scrap tire market for 2007. In addition, the data collected for each state are presented in Appendix B, which cumulatively comprise the numbers presented in Figure 3.

Figure 2 illustrates the trend from 2005 – 2007 in the U.S. scrap tire markets, tracking scrap tire generation, utilization and usage rates. Figure 3 shows the disposition of scrap tires in the U.S. in 2007 and the relative percentages for each market or other disposition. Figure 4 illustrates scrap tire market distribution trends from 2005 to 2007.

Market	2005	2007	% change	% of 2007 scrap tires generated	% of 2007 TDF Mkt
Tire-Derived Fuel	2144.6	2484.4	15.8%	54.1%	
Cement Kilns	*802.0*	*669.1*	-16.6%		26.9%
Pulp & Paper	*539.3*	*1066.9*	97.8%		42.9%
Electric Utilities	*373.3*	*343.8*	-7.9%		13.8%
Industrial Boilers	*290.4*	*200.6*	-30.9%		8.1%
Dedicated Tires to Energy	*138.3*	*203.5*	47.1%		8.2%
Lime Kilns	*not avail.*	*0.4*	n/a		0.0%
Ground Rubber	552.5	789.1	42.8%	17.2%	
Civil Engineering	640.0	561.6	-12.3%	12.2%	
Electric Arc Furnace	18.9	27.1	43.8%	0.6%	
Exported	112.0	102.1	-8.8%	2.2%	
Agricultural	47.6	7.1	-85.0%	0.2%	
Punched/ Stamped	100.5	1.9	-98.2%	0.0%	
Reclamation Projects	Unknown	132.6	n/a	2.9%	
Total to Market	3616.1	4105.8	13.5%	89.3%	
Land Disposed	590.8	594.0	0.5%		
Baled	42.2	9.3	-77.9%		
Generated	4410.7	4595.7	4.2%		
% to Market/Utilized	82.0%	89.3%	9.0%		
% Managed (incl. Baled and Landfill)	96.3%	102.5%	6.1%		

Table 3: U.S. Scrap Tire Market Trends, 2005 – 2007 (in thousands of tons).

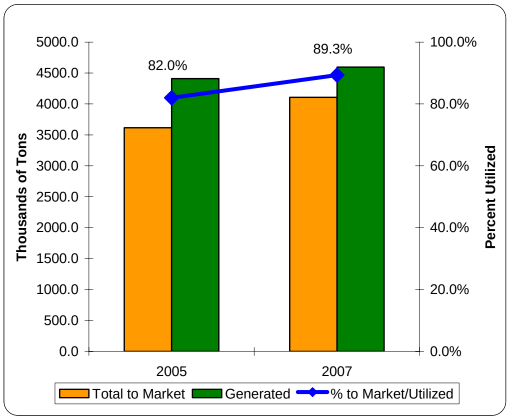

Figure 2: U.S. Scrap Tire Management Trends, 2005 - 2007.

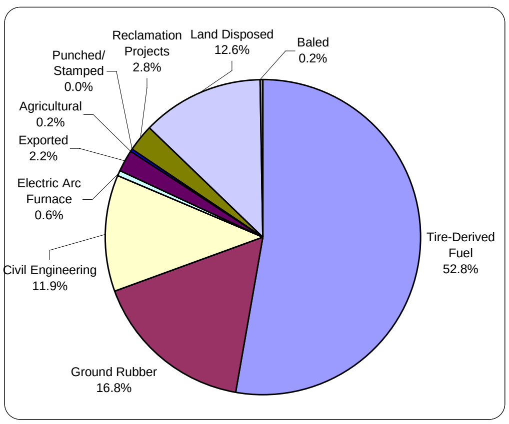

Figure 3: 2007 U.S. Scrap Tire Disposition.

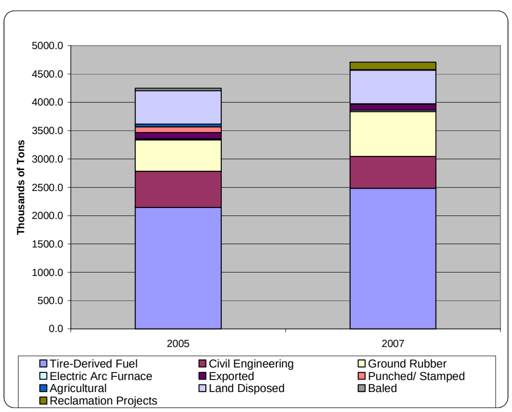

Figure 4: U.S. Scrap Tire Market Trends, 2005 – 2007

The markets for scrap tire and the scrap tire infrastructure, overall, are the strongest they have ever been. The demand for TDF, coarse rubber for mulch and playgrounds and ground rubber for infill material and bound, molded and extruded products reached an all-time high. Consequently, even with relatively high prices for energy, fuel and insurance, many scrap tire processors are expanding areas of operation and manufacturing product lines.

While the scrap tire industry did experience increased usage and end-user expansion in four major value-added markets, each one of these markets continues to face challenges. Still the outlook for each of these four markets is positive for the foreseeable future. As well, some regions of the country remain without markets or face other challenges and some companies went out of business during this period.

On the national level, information obtained from state agencies and the scrap tire industry clearly demonstrates that the area from Texas to Minnesota and eastward currently has demand for scrap tire products equal to the supply of scrap tires. In some regions, the demand for scrap tire-derived products, especially TDF, exceeds the supply. Some isolated areas in this geographic area continue have excess tires or limited markets, but such regions are becoming fewer.

In the West, Washington, Oregon, California and Arizona generally have good-to-strong demand for scrap tires, but the ability to landfill tires combined with limited market opportunities causes a considerable number of tires to be land disposed.

In every market there are winners and losers. Over the last two years the winners have been TDF, mulch, playground cover and ground rubber for products and infill material. The losers have been tire-derived aggregate (TDA) for civil engineering applications, and to a lesser degree, rubber modified asphalt.

The demand for TDA has decreased dramatically simply due to the fact that these other markets, TDF and mulch in particular, yield a better return on investment. In the Western states, the demand for the four strong markets are pulling tires away from the lowest value-added TDA application (alternate daily cover) and landfills while other TDA applications are being developed.

Rubber modified asphalt (or rubber asphalt concrete—RAC), while still a considerable value-added application for ground tire rubber, is being limited to the areas that have the historical usage of this material (Arizona, California and Texas), with relatively lower use in South Carolina and Florida. Since the prices paid for infill material and other ground rubber-derived products are higher than the prices paid for ground rubber for RAC, the supply for RAC is being diminished, as is the perceived need to develop a RAC market.

Interestingly, with elevated prices for oil, the cost of asphalt has increased dramatically. These economic conditions have created a situation where adding ground rubber to the asphalt binder can actually make the overall cost of the modified asphalt less costly than asphalt without ground rubber: adding rubber allows for the reduction of the volume of asphalt needed. How long this situation lasts, and whether the market can take advantage of this unique situation will be a function of: (1) the length of time that the cost for asphalt exceeds the cost of ground rubber; (2) how quickly this condition can be communicated to the asphalt paving industry; and (3) the availability of appropriate asphalt applications.

As described in the previous chapter, RMA is publishing scrap tire market information by weight in this report. In 2007, about 89 percent of the annually generated scrap tires went to end use markets, which compares to the 82 percent utilized in 2005.

The tire-derived fuel market consumed 2484.4 thousand tons of scrap tires in 2007, up from 2,144.6 thousand tons in 2005. In the TDF market, the increase was a function of the same three factors as reported in 2005: 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.

Use of tire-derived aggregate (TDA) in civil engineering markets declined since 2005. In 2007, 561.6 thousand tons of TDA were used in civil engineering applications. By comparison, 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.

In 2007, the ground rubber market increased to 789.1 thousand tons, as compared to the 37.47 million tires (552.51 thousand tons) consumed in 2005. 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 there has been significant growth in the market share of “coarse” sized particles. This particle range is used in mulch, 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 2005 to 2007, use of ground rubber as a modifier in asphalt remained relatively constant 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, which account for a small, basically static portion of the scrap tire marketplace.

The Post-Stockpile Marketplace

Scrap tires in stockpiles have been reduced by nearly 90 percent since 1990 resulting in a situation where more than half of the states have fewer than 100,000 tires remaining in stockpiles. RMA credits this tremendous progress to state efforts to abate stockpiled tires, develop sustainable scrap tire markets and enforce existing scrap tire laws and regulations. Stable markets have inhibited the reemergence of scrap tire stockpiles

Due to their typical physical condition (damage, dirt, debris, etc.), uses for scrap tires removed from stockpiles generally are limited to two markets: tire-derived fuel and tire-derived aggregate for civil engineering uses. From 1990 through 2007 the majority of the tires abated were consumed in these markets.

In some cases, when a state has abated all of its scrap tire stockpiles, the market previously consuming stockpiled tires discontinues use of scrap tires as its primary material. This has been observed primarily with relatively low-added value civil engineering applications, such as tire shreds for alternative daily cover at landfills or other rough shred applications. This post stockpile market adjustment negatively impacts the civil engineering market because annually generated tires are not likely to replace abatement tires in such low value-added markets.

In TDF markets, different trends have been observed after stockpiled tires have been abated. In cases where a cement kiln accepted abatement tires, the volume of scrap tires consumed by the kiln generally decreased once the flow of abatement tires ended. This is often due to the fact that the kiln received a higher tipping fee for abatement tires than the market price for annually generated scrap tires.

However, there have also been situations where TDF end users, have maintained the level of TDF usage after the flow of abatement tires ended. In these cases the use of abatement tires allowed for further expansion of the markets for annually generated scrap tires. Likely, the continued usage of TDF is related to competitive pricing for TDF as compared to other suitable fuels in situations where a heightened abatement tire tipping fee did not exist or was not sufficient to distort the marketplace relative to other fuels.

The significance of this transformation should not be lost. Where states have sold out conditions and no more stockpiles the probability is that the annual generation of scrap tires will have long-term end use markets. This should be the goal of all state programs and represents the ideal situation for the scrap tire industry. However, in states where abatement tires fuel market demand, continued attention must be paid to development of sufficient markets to address annually generated tires.

3

Tire-Derived Fuel

At the end of 2007, 123 separate facilities were permitted to use tire-derived fuel (TDF).[3] Total annual RMA-adjusted TDF consumption[4] in 2007 was 2484.4 thousand tons). The permitted capacity of many facilities in 2007, like in previous years, 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 2007 represents a 16 percent increase in the number of tires used as TDF since the end of 2005. Figure 5 shows TDF markets in 2005 and 2007 and projections for 2009. Figure 6 shows the distribution of TDF usage across the various markets in 2007.

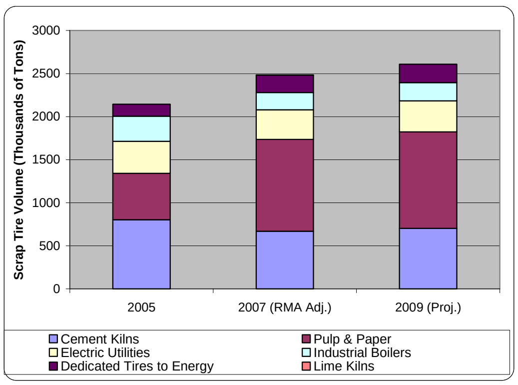

Figure 5: U.S. Tire-derived Fuel Market Distribution Trends, 2005 – 2007.

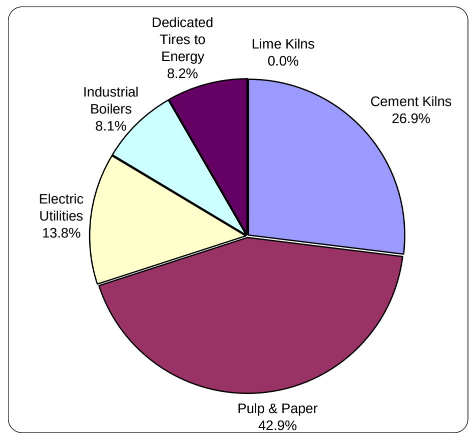

Figure 6: Tire-Derived Fuel Market Distribution, 2007.

While there have been continued improvements in the efficiency of the scrap tire infrastructure, clearly the most significant factor in the increased use of TDF has been the price of energy. For the past two years the marketplace witnessed unprecedented increases and prices for energy, most significantly the price of a barrel of oil, which drew upwards the prices of all other energy sources.

One of the more significant market trends of large-scale TDF users is the re-engineering or construction of permanent TDF feeding systems. These

[3] The 123 total facilities using TDF in 2007 included 43 cement kilns, 32 pulp and paper mills, 21 electric utility boilers, 17 industrial boilers, eight waste-to energy facilities, one lime kiln and one dedicated tires-to-energy facility.

[4] For a description of the RMA-adjustment factor, please see page 14 in the *Introduction* chapter.

actions indicate that these major TDF end use markets have made a commitment to the continued use of TDF. This is a very positive development for the long term stability of the TDF market and is an indicator that the use of TDF will remain at or near its current levels.

Energy prices also have impacted other tire-derived product markets, which will be discussed in greater detail in other sections of this report.

As reported in the last version of this report, the processing technology for TDF (fuel chips) has been continuously improving, as has the management of the processing operations. Together, these factors help maintain the consistent quality of the fuel chip necessary to maintain the new levels of demand.

However, some TDF end users and potential TDF users continue to view TDF as merely a waste product and are not willing to accept a price that is necessary to sustain a processor to produce a consistently high quality two-inch minus fuel chip. In these cases, the end user often is supplied a relatively large and coarse piece of rubber for the price they are willing to pay, which serves to dissuade the end user from continuing TDF use, which serves to reduce the level of usage to the point that it is no longer economically viable to transport the material to the facility.

These situations are becoming less frequent due to a series of market forces. When the TDF market data is analyzed, several new trends can be determined. The number of pulp and paper mill boilers using TDF increased, as did the overall rate of usage at the majority of facilities. In fact, for the first time pulp and paper mills have outpaced cement kilns in TDF usage. This development is significant because pulp and paper mills use a processed TDF chip purchased as a commodity fuel, whereas cement kilns typically consume whole tire TDF for a tipping fee. These changes will be further discussed in the next section.

One of the trends reported in the 8th Biennial Report, the generation and capture of coarse rubber from TDF producing operations for use in other coarse ground rubber markets, continued and expanded over the last two years. In other cases, the production of coarse rubber, as well as tire chips for horticultural products, took potential supply away from TDF generating operations. One of the general observations of the scrap tire infrastructure over the last two years is that it is a constantly changing landscape, with scrap tire processors moving into and out of markets on a regular basis.

The RMA would like to remind the readers of the ASTM International standard for TDF, which is an important component in the process of making commodities of tire-derived materials (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.

Pulp and Paper Mills

At the end of 2007 there were 32 pulp and paper mill boilers consuming 1066.9 thousand tons of scrap tires, up from 24 pulp and paper mill boilers consuming 539.3 thousand tons of scrap tires at the end of 2005. As mentioned above, for the first time, pulp and paper mills have surpassed cement kilns in total volume of TDF consumed annually. Rising energy costs account for this increase, along with the increasing reliability of quality TDF chips supplied in the market. Appendix C lists the pulp and paper mills in the U.S. that utilized TDF in 2007.

The increase in both the number of mills using TDF and the amount of TDF consumed are both dramatic. Furthermore, the scrap tire industry has experienced a rippled effect in the South/Southeastern and Midwestern regions of the country due to this increased TDF use. Basically, the increase in demand and use of TDF has caused dramatic shifts to the supply chain. Scrap tire collectors (haulers) are traveling greater distances to obtain tires in these high demand areas and scrap tire processors are shifting their production schedules and sales outlets to accommodate this dynamic marketplace. Unfortunately, the pulp and paper industry is not evenly distributed across the country, but found in three regions: the Northeast, Southeast and North Central regions, so opportunities for market expansion into other regions of the country are limited.

As referred to earlier, the focus to reduce energy costs in paper mills has had an impact on another tire-derived product's marketplace. The use of bark as a fuel has increased in the last two years, which has taken away some of the supply for the mulch market. The use of bark as a fuel has not impacted the demand for TDF and allowed a market opportunity for tire mulch to become established in the landscaping industry.

The Cement Industry

At the end of 2007, 669.1 thousand tons of scrap tires were consumed in the U.S. by a total of 16 cement companies using TDF in a total 43 cement facilities across the county (one location could have multiple kilns using scrap tires). TDF usage in cement kilns contracted from 2005 to 2007 by about 17 percent (down from 802 thousand tons in 2005). The majority of these tires were whole, although a significant amount was processed (rough) shreds. Appendix C lists the cement kilns in the U.S. that utilize scrap tires as fuel.

The reduction in market demand for TDF in cement kilns can be attributed to the following factors: (1) increased market demand for processed TDF chips by the pulp and paper industry, which garner a higher return on investment for the scrap tire processor and (2) significantly lower nationwide demand for cement due to the economic downturn and resulting decrease in building and construction.

A series of dichotomies exist within the cement industry. On one hand, where/when a cement kiln is located in a region of very high demand for high quality TDF (2” minus) and or high demand for ground rubber, the supply of whole tires for fuel has been affected, as have tipping fees collected by the kiln. In cases where a kiln uses processed (rough shredded) tires, prices paid by the kiln for this material have increased. On the other hand, the marketplace has also seen that supply of tires to the cement industry pulled tires away from lower-valued end uses, primarily tire-derived aggregate and in some cases away from being landfilled.

The practice of shifting tire supply from one end use to another is the perfect function of the marketplace. Even though doing so does not increase the overall number of tires going to an end use, it does improve the economics of the scrap tire processor. Diverting scrap tires from landfills is the ultimate goal of all scrap tire market development programs.

In the last two years, the market has also seen the beginning of a trend where whole scrap tires are being diverted from the flow of supply to cement kilns. As was the case where supply is being diverted to TDF from TDA for civil engineering markets, the return on investment is improved for processors when they can process tires into products and sell them for a positive amount as opposed to paying a tip fee to bring the same tires to a cement kiln. While this occurrence is not widespread, it is becoming more common in those regions where demand for tire-derived products equals or exceeds their supply.

TDF consumption by the cement industry is related to the following factors: (1) demand for cement, (2) cost of energy, (3) favorable cost implications, (4) reduction of nitrogen oxide emissions as compared to other fuels and (5) competition by other TDF markets.

Still, not all cement kilns are using TDF at or near their permitted capacity. In several cases, especially in the Western portion of the county, four market forces are at work: the overall supply of TDF available in any given area; the distance a supplier has to travel to supply TDF to a kiln; the prices paid for the TDF; and development of competing markets in the same region.

As reported in previous editions of this report, environmental considerations continue to play a key role in the use of TDF in cement kilns. Federal and state efforts to reduce emissions of nitrogen oxides (NO_x) 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.

Electric Utilities

In 2007, 21 utility boilers consumed 343.8 thousand tons of scrap tires, representing a slight decrease from 2005 when 17 electric utility boilers were using TDF on a regular basis, consumed the equivalent of 27 million scrap tires (373.3 thousand tons).

There was no single cause for the decrease; it appears that each loss was due to conditions unique to each utility. Factors that impacted this market sector included changes in operations

management, permitting negotiations, shifting markets for processors and renewed contracts for coal.
Appendix C lists the utility boilers in the U.S. that utilized TDF in 2007.

Industrial Boilers

In 2007, 17 industrial boilers consumed 200.6 thousand tons of scrap tires as TDF compared to 2005 when 16 industrial boilers consumed 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 2007. This decrease can be attributed to several plant closures and reduced rate of TDF usage. The closure of the plants was due to a series of reasons, including overall economic conditions, operational problems and the use of low quality TDF.

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. In 2007, only one dedicated tires-to-energy facility was in operation, which consumed about 203.5 thousand tons of scrap tires as TDF. In 2007, the use of whole and/or processed tires in dedicated scrap tires-to-energy facilities was 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 had extended favorable rates for electricity to alternative fuel-fired utilities. In 2008, this facility resumed operation, so the next edition of this report will show additional TDF usage in this category, assuming its operation continues in 2009.

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

In 2007, one lime kiln reported using 0.4 thousand tons of TDF. 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 manufacture 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 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. 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

Over the past two years little has changed in this market niche. In 2005, six facilities in Florida were the only resource recovery facilities reported to be using TDF on a regular basis, even though it is common to have some tires in the overall supply of municipal solid waste that comprises the bulk of the materials combusted. In 2007, eight facilities reportedly are using TDF. Similar to 2005, all these facilities are in Florida.

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. Also, combusting municipal solid waste, a very heterogeneous material presents challenging environmental issues on its own.

EPA Rulemaking on Definition of Non-Hazardous Solid Waste under RCRA for Clean Air Act Purposes

In response to the U.S. Court of Appeals D.C. Circuit decision in 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)), EPA published an Advanced Notice of Proposed Rulemaking (ANPRM) on January 2, 2009.[5] The ANPRM addresses identification of non-hazardous solid waste for purposes of regulation of air emissions from combustion under the Clean Air Act.

In NRDC v. U.S. EPA, four environmental organizations challenged two final rules promulgated under the Clean Air Act – the Industrial, Commercial and Institutional Boilers and Process Heaters or "CISWI Definitions" Rule[6] and the Boiler

[5] Advanced Notice of Proposed Rulemaking (ANPRM) on Identification of Non-Hazardous Materials That Are Solid Waste, DOCKET ID NO. EPA–HQ– RCRA–2008–0329, 74 Fed.Reg. 41 (January 2, 2009).

[6] The National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters, 69 Fed. Reg. 55,218 (Sept. 13, 2004), *as amended on recons.*, 70 Fed. Reg. 76,918 (Dec. 28, 2005), (Boilers Rule), promulgated pursuant to section 112 of the Clean Air Act (CAA), 42 U.S.C. § 7412.

Rule.[7] In the final CISWI rule, EPA 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.

In its opinion, the U.S. Court of Appeals for the D.C. Circuit held that that EPA's definition of "commercial or industrial waste," as incorporated in the definition of "commercial and industrial solid waste incineration unit" (CISWI unit), is inconsistent with the plain language of section 129 and that the CISWI Definitions Rule must therefore be vacated." The Court also vacated the Boilers Rule because the vacateur of the CISWI Definitions Rule would require substantial modifications to the Boiler Rule.

EPA Rulemaking

In response to the Court's vacateur of the CISWI Definitions Rule and the Boiler Rule, EPA published an Advanced Notice of Proposed Rulemaking ("ANPRM") on the Identification of Non-Hazardous Materials That Are Solid Waste on January 2, 2009.[8] In the ANPRM, EPA seeks to define non-hazardous materials that are solid waste and distinguish them from other materials not classified as non-hazardous materials that are not solid waste under RCRA for purposes of the Clean Air Act. This is important because under section 129 of the Clean Air Act ("CAA"), the term "solid waste" is defined as having the meaning "established by the Administrator pursuant to [RCRA]."[9]

In the ANPRM, EPA stated that the manner in which non-hazardous secondary materials are processed, the nature of the materials, and the ways in which they are used or recycled generally establishes whether such materials are wastes or ''by-products.'' EPA identified eight non-hazardous secondary material fuels or fuel groups[10] and six non-hazardous ingredients, or ingredient groups.[11] Scrap tires are included in the list of secondary fuel sources.

[7] The Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Commercial and Industrial Solid Waste Incineration Units, 70 Fed. Reg. 55,568 (Sept. 22, 2005) (CISWI Definitions Rule), *amending* Standards of Performance for New Stationary Sources and Emissions Guidelines for Existing Sources: Commercial and Industrial Solid Waste Incineration Units, 65 Fed. Reg. 75,338 (Dec. 1, 2000) (CISWI Rule), promulgated pursuant to CAA section 129, 42 U.S.C. § 7429.

[8] Advanced Notice of Proposed Rulemaking (ANPRM) on Identification of Non-Hazardous Materials That Are Solid Waste, DOCKET ID NO. EPA–HQ– RCRA–2008–0329, 74 Fed.Reg. 41 (January 2, 2009).

[9] "RCRA" is the Resource Conservation and Recovery Act (42 U.S.C. § 6901 et seq.), enacted in 1976 and amended in 1984. RCRA amended the Solid Waste Disposal Act of 1965.

[10] EPA identified eight fuel source materials: (1) the biomass group (pulp and paper residuals, forest derived biomass, agricultural residues, food scraps, animal manure, gaseous fuels); (2) construction and demolition materials (building related, disaster debris, and land clearing debris); (3) scrap tires; (4) scrap plastics; (5) spent solvents; (6) coal refuse; (7) waste water treatment sludge; and (8) used oil. ***See,*** 74 Fed. Reg. at 46.

[11] EPA identified six materials used as ingredients: (1) blast furnace slag; (2) cement kiln dust (CKD); (3) coal combustion product group (fly ash, bottom ash, and boiler slag); (4) foundry sand; (5) silica fume; (6) and secondary glass material. ***Id.***

EPA outlined its preliminary approach to identifying legitimate fuels, thus excluding them from the definition of non-hazardous waste under RCRA. The categories included are: (1) traditional fuels; (2) secondary materials used as legitimate ''alternative'' fuels that have not been previously discarded; (3) secondary materials used as legitimate ''alternative fuels'' resulting from processing of discarded secondary materials; (4) secondary materials used as legitimate ingredients; and (5) hazardous secondary materials that may be excluded from the definition of solid waste under RCRA Subtitle C because they are more like commodities than wastes.[12] In the proposal, scrap tires are included in categories 2 and 3.

RMA supports EPA's treatment of annually-generated tires in the ANPRM by defining them as a fuel. Regarding materials that were previously discarded, EPA states that previously discarded materials would need to be processed to be considered fuels or ingredients rather than waste. With TDF, previously discarded scrap tires (i.e., tires removed from stockpiles) would need to be processed and not consumed whole in order to be considered fuel. RMA supports EPA's recognition that previously stockpiled tires can be reclaimed once discarded and classified as a fuel after "processing." However, in its comments, RMA recommends a more expanded definition of "processing" to allow for greater volumes of scrap tires to be utilized as TDF.[13]

EPA listed proposed criteria to determine whether materials were legitimate alternative fuels or ingredients. For legitimate alternative fuels, the criteria are: (1) handled as a valuable commodity; (2) meaningful heating value; (3) presence of non-fuel contaminants.[14] For legitimate alternative ingredients, the criteria are: (1) handled as a valuable commodity; (2) useful contribution; (3) valuable product or intermediate; and (4) presence of contaminants.[15] In its comments, RMA supports the concept of criteria but opposed the inclusion of contaminants or specific Btu value criteria.

EPA also solicited comments on an industry recommended approach to defining fuels, referred to as the Hybrid Regulatory Approach.[16] This approach would list certain materials that would be considered fuels and provide criteria to evaluate other materials for consideration as fuels. RMA, as one of the proponents of this approach to EPA supported the approach in its comments to EPA.

EPA also requested comments on the potential impact of the proposal on state solid waste programs. RMA recognizes the continuing state need to regulate scrap tire management and enforce state regulations on scrap tire hauling, storage, etc. RMA advocates that states must retain that ability, while EPA recognizes TDF as a fuel for purposes of CAA section 129.

[12] ***Id***. at 53.
[13] Comments of the Rubber Manufacturers Association on the U.S. Environmental Protection Agency Advanced Notice of Proposed Rulemaking (ANPRM) on Identification of Non-Hazardous Materials That Are Solid Waste, http://www.regulations.gov, public submission EPA-HQ-RCRA-2008-0329-0353.1.
[14] 74 Fed.Reg. at 54 *et seq*.
[15] ***Id.*** at 55 *et seq.*
[16] ***Id.*** at 60.

Concerns Associated with Potential Loss of TDF Markets

If facilities using TDF for energy recovery were required to comply with CAA section 129, this would impose additional regulatory and administrative burdens on such facilities and would serve as a significant disincentive to TDF use. RMA is concerned that this distinction would discourage TDF use, harm TDF markets and disrupt scrap tire management across the United States. If facilities currently using TDF were to curtail TDF use, scrap tries would begin to accumulate at scrap tire processor's facilities, and most processors would quickly exceed the permitted limit of scrap tires stored on-site. This could also cause increased illegal dumping of tires as well as the re-creation of tire stockpiles.

In states that allow landfilling of scrap tires, a dramatic increase in the number of landfilled scrap tires would also be anticipated. Nationwide, the percent of annually-generated scrap tires going to landfills would increase from 10 percent to approximately 60 or 80 percent. Furthermore, an increased percentage of abated tires would be landfilled as well (difficult to estimate, but probably in the 90 percent range of abatement tires).

In those states that currently restrict or ban landfilling of scrap tires, we would expect to see an increase in the number of scrap tires stored at processors' facilities beyond permitted limits and new illegal stockpiles would be anticipated unless those states relaxed current landfilling restrictions. ***See* Chapter on Land Disposal of Tires** for more discussion on related issues.

An increase in stockpiled scrap tires would increase the probability of large-scale, outdoor, uncontrolled tire fires. It is well documented that scrap tire stockpile fires pose a significant environmental and public health risk. An increase in dumped tires would increase the probably of increased mosquito-borne diseases, especially in highly populated urban sectors, but in rural areas as well.

Ripple Effects on other Markets

In most regions of the country, TDF serves as the "anchor" scrap tire market, economically supporting the collection, hauling and processing infrastructure and allowing smaller markets for other uses to thrive. With the loss of the TDF market, an increase in the costs to collect and dispose of scrap tires would follow since TDF would not be supporting the infrastructure.

Within several months a relatively high number of scrap tire processors could go out of business due to increased cost (caused by the loss of the economy of scale created by processing tires for TDF), loss of markets, the inability to landfill tires or the exceedance of permitted limits for on-site storage, barring any waiver by the state.

No significant increase in the amount of tire rubber going to higher value-added end uses is projected to occur in response to the decrease in TDF capacity. The amount/availability of scrap tires is not the limiting factor in the expansion of the markets/end uses for higher value-added products. Instead, these markets are limited by a number of factors: limited demand for such products, variable ground rubber quality and limited end-use applications.

Rather, if landfills made accessible to greater scrap tire volumes, less ground rubber supply likely would be available to the marketplace since not all of the companies that manufacture ground rubber are vertically integrated (not all do collection, rough processing and finish processing). Many ground rubber (and coarse rubber) manufacturers obtain feedstock material from companies that collect and process whole tires into TDF. It could be possible that some ground rubber producers could buy out other (TDF processing companies and continue their operations. But without an economy of scale (1.5 – 2 million tires minimum), this scenario would not be successful.

Geographic Assessment

The impacts of a major contraction in TDF demand would cause varied effects across the country, depending on the degree to which the region currently relies on TDF markets. Figure 7 shows an analysis by region of the country, showing the percentage the total regional scrap tire market volume consumed by the TDF market. Since scrap tire markets, particularly for TDF, are regional in nature, for this analysis RMA has grouped some U.S. EPA Regions. For purposes of this analysis, the New England region includes U.S. EPA Region I, the Mid-Atlantic region includes U.S. EPA Regions II and III, the Southeast/South Region includes U.S. EPA Regions IV and VI, the Great Lakes region includes U.S. EPA Region V, the Midwest Region includes U.S. EPA Region VII, the Plains/Mountains region includes U.S. EPA Region VIII and the West includes U.S. EPA Regions IX and X.

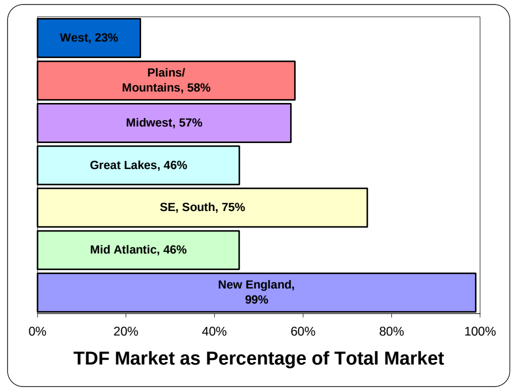

Figure 7: 2007 Regional TDF Markets, as Function of Total Regional Scrap Tire Market.

The New England area would be especially affected since 99 percent of the tires in the region go to TDF. This is also an area where states have closed landfills to scrap tires, so dumping and stockpile formation are highly likely.

The Mid-Atlantic region would also be severely impacted since a high percentage of this region's tires are shipped to New England or Pennsylvania for TDF. This area also relies heavily on TDF, so the problems would be similar to those in New England. Because several ground rubber producers operate in New York and Pennsylvania, there could be markets for about 33 percent of the scrap tires generated in this region, given the markets for coarse and fine rubber products and civil engineering projects.

The South/Southeast would also be severely impacted, since TDF is the major scrap tire market in the region. Tire-derived aggregate for civil engineering applications used to be a significant market in this region, but has declined in recent years with the surge in the TDF market. If this market were to be reinvigorated, it would potentially use approximately 20 percent of the scrap tires generated. The major challenge would be how to redevelop the civil engineering market that existed before processors begin going out of business.

In the Southwest, two states do not rely on TDF: Arizona, which uses scrap tires in rubber-modified asphalt applications or landfills them in (California) and New Mexico, which bales and stores scrap tires for potential civil engineering uses. These states could both continue with current practices. The other states in the region (Texas and Oklahoma) would be hard hit because TDF uses the vast majority of the scrap tires generated in these states, and no other major market opportunities exist.

The Western states could see a dramatic increase in landfilling of tires where TDF constitutes a large percentage of the overall market in the state: California (27 percent), Idaho (100 percent), Oregon (52 percent) and Washington (25 percent) have access to landfills as a disposal option for scrap tires. Wyoming and Nevada already landfill all of the scrap tires generated in-state, so landfilling would continue. Utah would be adversely impacted, since TDF is the only major market there.
In the North Central states, scrap tires are currently being landfilled or baled, so little to no change would occur except in Minnesota, which does supply TDF to surrounding states.

The Midwest would be significantly impacted because TDF consumes more than 75 percent of the scrap tires generated in the region. Only Ohio allows landfills to accept tires, so piling of tires would be expected.

The Mid-South region would probably witness a dramatic increase in the number of tires landfilled. Tennessee, Arkansas and West Virginia all allow tires into landfills. Given that there is a sold-out condition for TDF in this region, we would anticipate that some 10 million scrap tires would be landfilled from this region. The Plains states (NE, KS, MO, IA) would all lose TDF markets and also see an increase in the number of tires being landfilled.

RMA continues to actively address this issue and advocate for a regulatory framework that would not hinder TDF markets. At this writing, EPA is scheduled to issue a Notice of Proposed Rulemaking (NPRM) in July 2009 and a Final Rule in July 2010.[17] EPA is under a Court-ordered deadline to complete the final rules in this area by July 15, 2010.

Positive EPA Statement on Tire-Derived Fuel

As reported in the last edition of this report, the EPA posted its position statement on TDF onto their web site in 2005. 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

[17] ***See,*** United States Environmental Protection Agency Semiannual Regulatory Agenda, Spring 2009, EPA-230-Z-09-001 (May 11, 2009). http://www.epa.gov/lawsregs/documents/regagendabook-spring09.pdf (accessed May 21, 2009).

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[18]

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.

18 http://www.epa.gov/osw/conserve/materials/tires/tdf.htm (visited May 18, 2009).

Market Outlook

The outlook for the TDF market remains positive over the next two years. There is every indication that TDF markets will remain strong for the foreseeable future, barring any legal or regulatory disruptions. Of concern, however, is that the vast majority of potential TDF end users are already using TDF, have opted not to begin using TDF or have discontinued TDF use. This leaves limited capacity for extensive expansion of this market. Consequently, RMA projects a five percent expansion of the TDF market in the next two years. Table 4 shows the historical TDF trends and projected market expansion for 2009.

TDF Market	2005	2007 (RMA Adj.)	2009 (Proj.)
Cement Kilns	802	669.1	702.5
Pulp & Paper	539.3	1066.9	1120.2
Electric Utilities	373.3	343.8	361.0
Industrial Boilers	290.4	200.6	210.6
Dedicated Tires to Energy	138.3	203.5	213.7
Lime Kilns	not avail.	0.4	0.5
TOTALS	**2143.3**	**2484.4**	**2608.6**

Table 4. 2005 through Projected 2009 Tire-Derived Fuel Markets (in thousands of tons).

Limited potential TDF market capacity exists in some regional markets, due to scrap tire supply constraints or a limited number of facilities that can use TDF. Furthermore, several markets are rapidly approaching these limits. In the cement industry there appear to be only another six cement kilns that could readily use TDF. In the pulp and paper industry, RMA estimates that five additional mills could use TDF. There are no utility boilers known to be considering TDF. On the positive side, the other dedicated scrap tire-to-energy facilities is scheduled to resume using TDF in the near term. The industrial boiler market has a greater expansion potential, although this realizing this potential is dependent on the availability of TDF supply.

Also, as the federal government continues to debate national climate change policy, the biomass content of tire-derived fuel must be infused into the debate. RMA estimates that over 25 percent by weight of TDF fuel value is biomass (from the natural rubber used in tire manufacturing). As well, TDF displaces fossil fuels in a facility’s fuel mix, thus reducing the demand of fossil fuels. TDF users should be recognized for offsetting fossil fuel use through the utilization of TDF.

Cement Industry

Over the last two years several cement kilns stopped using TDF, while several others are using very low quantities of TDF. While there has been a downward trend in this market sector, the use of TDF by the cement industry remains a cornerstone of the overall TDF market. There are several kilns that are actively developing a plan to use TDF, so we anticipate a modest increase in the level of usage by the cement industry over the next two years.

Given the trends of the last two years, it is reasonable to conclude that the kilns using relatively low percentages of TDF (five percent or less of their fuel source) are unlikely to increase the level of usage either due to a limited supply of tires, limitations of their system or a management decision. It is anticipated that the kilns using relatively large amounts on TDF will continue to do so. These kilns have obtained a consistent supply of scrap tires, have the technology and capacity to use tires and a management team that has accepted TDF as part of the kiln’s fuel supply. Likely, the economic aspects of TDF use remain positive as well.

Another consideration in the overall usage rate is that the majority of stockpiled tires have been abated, which has ended a lucrative supply of TDF to cement kilns. Still, the data collected suggest that the use of scrap tires in cement kilns will continue to be a major end-use market. Maximum capacity may be reached by 2010. This will clearly have an impact on the marketplace, adding more stability to regional markets.

In those regions with cement kilns using TDF, the kilns serve as the anchor market. Any further expansion of markets for tire-derived products must provide a market opportunity sufficient to divert the flow of tires to these kilns, be brought in from some distance, taken from another market (TDA for civil engineering) or diverted from the landfill.

Pulp and Paper Industry

Pulp and paper industry demand for TDF is so strong in the Southeast (North Carolina to Louisiana) that supply cannot keep pace. Consequently, in this region, growth of this market will be limited because of the already extremely high demand for TDF and consequent lack of supply. This suggests that the current level of TDF consumption will be sustained, because any excess supply would be shifted to a new end user or used to satisfy increased demand from an existing end user.

Furthermore, if TDF transportation costs can be maintained at a reasonable level this could allow for TDF to be transported across larger distances. Currently, with the combination of relatively high transportation costs and strong market demand for tire-derived products in the Southeast/Midwest region, bringing TDF from farther distances seems unrealistic.

The situation in the Northwest differs dramatically. Here, a supply of relatively low cost petroleum coke from Asia 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

There have been a series of factors that have led to the slight decrease in this market sector. Changes in company management, permitting issues and cost considerations all had an impact on this market niche. Overall, however, given the locations of the utilities that discontinued TDF use, ample other markets were available to absorb the excess supply. Given recent trends in this market sector, RMA projects that that there might not be any increase in utility demand for TDF over the next two years.

Industrial Boilers

RMA anticipates a substantial increase in this market niche. The data collected suggest there are several industrial boilers that started using TDF in 2008. This could increase the amount of TDF consumed by 5 to 8 million tires.

Dedicated Tires-To-Energy Facilities

According to the data collected, the dedicated tire-to-energy facility in Illinois has become operational and is using TDF. Consequently the number of tires consumed in this market niche will increase between 2008 and 2009. However, as stated in the last report, 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

Ground Rubber Applications

In 2007, ground rubber applications consumed about 789.1 thousand tons of scrap tires, representing a 43 percent increase since 2005. In 2005, 552.5 thousand tons of scrap tires were consumed by ground rubber markets.

Assessing the ground rubber market for scrap tires poses several challenges. First, most state agencies do not track this information. Second, the major ground rubber processors do not all track the entire markets or define the same applications the same way. Some sources included tire buffings in market numbers, while others did not. Consequently, it is not possible to provide precise estimates about the sources of ground rubber in the marketplace. However, it is possible to assess the overall market for ground rubber.

The type of market information available from ground rubber processors suggests that it is appropriate to classify the various market segments in macro-terms, rather than by specific applications. For example, in the automotive category, ground rubber applications would include new tires and any product used in the automotive industry (muffler hangers, insulation, sound proofing, molding, etc). While this is a reasonable way to classify classes of uses, it differs from the way this report has historically reported these uses, making it more difficult to do a year-to-year comparison. Unfortunately, the data collected did not follow the historical pattern.

Overall, the market segments for ground rubber fall into the five categories listed in Table 5.

Automotive	100
Molded/ Extruded Products	400
Sports Surfacing	300
Playgrounds/Mulch/ Animal Bedding	100
Asphalt	100
Export	100
TOTAL	**1100**

Table 5. Estimated U.S. Ground Rubber Markets, 2007 (in millions of pounds).

Figure 8 shows the estimated distribution of ground rubber for 2007 among these various markets. The "export" category should be distinguished from the Export market described later in this report. The exported material documented here is ground rubber processed in the United States and exported to markets in the European Union and Japan. The Export market discussed in the Miscellaneous Markets Chapter reflects the export of whole tires, presumably for use on vehicles.

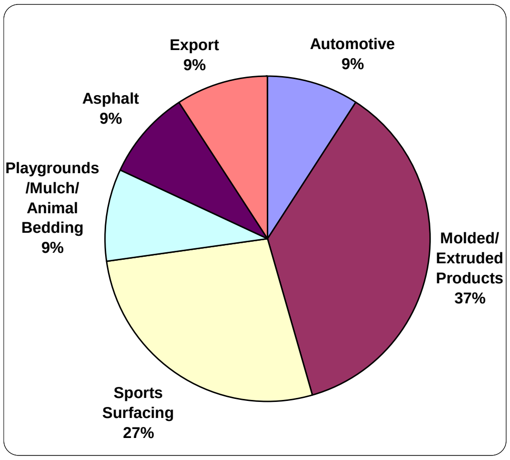

Figure 8: U.S. Ground Rubber Market Distribution, 2007.

As referred to earlier in this section, 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. has held steady at 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 2007, as in previous years, all demand for ground rubber above the 250 million pounds of buffings were supplied from scrap tire rubber. In addition to the buffings generated in the U.S., there are some 150 million pounds of tire buffings imported from Canada. These 400 million pounds of tire buffings are typically used in bound rubber products, due to the size and shape of the buffing itself.

Figure 9 shows the historical contributions of tire buffings and processed whole tires to the total U.S. ground rubber market.

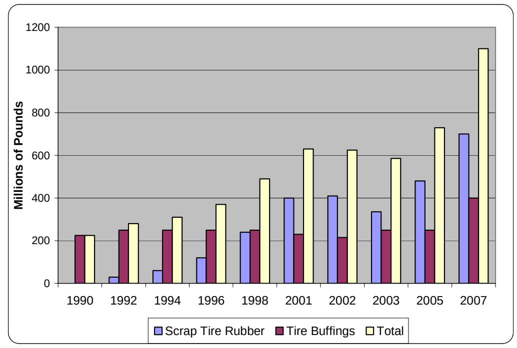

Figure 9: U.S. Ground Rubber Supply, 1990 – 2007.

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

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 some 800 sports fields in the United States in 2007.

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 playground and sport surfacing applications will at some point begin to stabilize. 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, absent some new technological developments..

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 kind of 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 remains one of the most significant 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.

Playground Cover

Overall, the ground rubber playground market, typically loose fill, has been slowed by several factors. As stated in the last report, 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 among 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.

Market Challenges

Over the past two years, a series of allegations and concerns has come to the forefront and have impacted this market segment. Allegations have emerged about potential exposure to lead in artificial turf systems, surface heating of artificial turf systems and playground applications, potential human health risks associated with recreational applications for scrap tire rubber and compliance issues associated with rubber playgrounds and the Americans with Disabilities Act (ADA).

Potential Lead Exposure associated with Artificial Turf Applications

Concerns were raised about lead levels in artificial turf applications and scrap tire rubber as a potential source of the lead content. Two federal agencies reported studies in 2008, both finding low lead levels in artificial grass in artificial turf applications but neither cited scrap tire rubber in artificial turf systems as a concern for lead content.

Centers for Disease Control and Prevention (CDC) and the Agency for Toxic Substances and Disease Registry (ATSDR) are monitoring the situation because of their interest and expertise in the prevention of lead poisoning. The CDC has reported about a study conducted by the New Jersey Department of Health and Senior Services (NJDHSS) shows that "that limited sampling of additional athletic fields in New Jersey and commercial products indicates that artificial turf made of nylon or nylon/polyethylene blend fibers contains levels of lead that pose a potential public health concern. Tests of artificial turf fields made with only polyethylene fibers showed that these fields contained very low levels of lead."[19] The CDC noted, though, that lead levels were higher in worn fields where the grass fibers were abraded.

The Consumer Products Safety Commission (CPSC) has also reviewed the issue of lead exposure in artificial turf applications. In a June 2008 report, the CPSC concluded that artificial turf fields are "OK to install, OK to play on."[20] In its report, the CPSC stated that "several of the products obtained by staff contained lead in the synthetic grass with concentrations ranging from 0.09 percent lead by weight to 0.96 percent. The testing showed that lead content varied between synthetic turf installations, and also within a field depending on color."[21] However, given transfer rates of lead or lead containing material to children during the course of play, the CPSC concluded that no exposures associated with the tested lead levels would exceed CDC-recognized safe exposure threshold of 10 micrograms of lead per deciliter of blood (10 μg/dL).

Surface Heating in Recreation Applications

Rubber playground cover absorbs heat, and there have been cases where bare footed children have suffered burns from the heated surface. ASTM International F08.63 Subcommittee on Playground Surfacing Systems has recommended that signs be posted at playgrounds that state that in the summer surface temperatures can become elevated and that parents should not allow their children to go bare footed on these surfaces.

Potential Health Concerns about Recreational Applications

Recently, concerns have been raised about potential health issues and chemical exposure in recreational applications for ground rubber from scrap tire sources. Several government agencies have conducted studies to address these issues. Most notably, the California Integrated Waste Management Board (CIWMB)[22], the New York City Department of Health and Mental Hygiene (NYC DOHMH)[23] and the New York State Department of Environmental Conservation (DEC)/New York State Department of

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19 http://www2a.cdc.gov/HAN/ArchiveSys/ViewMsgV.asp?AlertNum=00275 (accessed May 26, 2009). ***See also***, http://www.cdc.gov/nceh/lead/artificialturf.htm (accessed May 26, 2009) and http://www.state.nj.us/health/artificialturf/index.shtml (accessed May 26, 2009).

20 http://www.cpsc.gov/cpscpub/prerel/prhtml08/08348.html (accessed May 26, 2009).

21 http://www.cpsc.gov/library/foia/foia08/os/turfassessment.pdf (accessed May 26, 2009).

22 ***Evaluation of Health Effects of Recycled Waste Tires in Playground and Track Products,*** California Integrated Waste Management Board ("CIWMB"), produced under contract by the California Office of Environmental Health Hazard Assessment ("OEHHA"), January 2007 ("CIWMB/OEHHA Report"). http://www.ciwmb.ca.gov/publications/Tires/62206013.pdf (accessed May 27, 2009).

23 ***A Review Of The Potential Health And Safety Risks From Synthetic Turf Fields Containing Crumb Rubber Infill***, Prepared for New York City Department of Health and Mental Hygiene New York, NY. Prepared by TRC, Windsor, Connecticut, May 2008 ("NYC DOHMH Report"). http://www.nyc.gov/html/doh/downloads/pdf/eode/turf_report_05-08.pdf (accessed May 27, 2009).

Health (DOH)[24] commissioned studies to examine health and safety risks. RMA also recently released a comprehensive literature review on the potential of human health risks from scrap tire rubber.[25] All of these studies concluded that crumb (ground) rubber does not pose a significant risk to the environment or the health and safety of children using them.

The CIWMB/OEHHA Report evaluated playground surfaces "for the release of chemicals that could cause toxicity in children following ingestion or dermal contact" by reviewing existing literature, evaluating toxicity due to ingestions based on gastric simulation, evaluation of toxicity due to chronic hand-mouth contact, testing for skin sensitization from contact with playground surfaces containing recycled tires, reviewing potential damage to the local environment and ecology and evaluation of potential injuries to children playing on surface made from recycled tire material.[26]

In the first two cases, the report found the risk to be well below the *di minimis* cancer risk level (1×10^{-6} or one in a million). In the third case, exposure from chronic hand-mouth contact, the increased cancer risk was slightly higher than the *di minimis* level but is "generally considered an acceptable cancer risk due to its small magnitude compared to the overall cancer rate.[27] In the fourth evaluation, no skin sensitization was found from exposure to tire-derived material or synthetic rubber EPDM. The report stated that these results suggest that the materials tested would not cause skin sensitization in children or elicit a reaction from already sensitized individuals. In the fifth analysis, the report showed that playground surfaces containing scrap tire rubber would not be likely to cause leaching of concern to local flora and fauna. In the sixth research area, the study showed some concern with installed playground surfaces in California meeting established Head Impact Criterion ("HIC"). The report cautioned that installers of rubber playground material should be mindful of HIC and install material of a depth sufficient to pass the established tests for HIC.

The NYC DOHMH Report studied the chemical components of crumb rubber and potential health and safety risks associated with synthetic turf fields. The study found that the chemical composition of ground rubber varies, depending on the type of crumb rubber, the type analysis performed and the media (air, water, waste, etc.) analyzed. The report concluded that "eleven different risk assessments applied various available concentrations of COPCs [chemicals of potential concern] and none identified an increased risk for human health effects as a result of ingestion, dermal or inhalation exposure to crumb rubber."[28]

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[24] *As Assessment of Chemical Leaching, Releases to Air and Temperature at Crumb-Rubber Infilled Synthetic Turf Fields,* New York State Department of Environmental Conservation and New York State Department of Health, May 2009. ("NYSDEC/NYSDOH Report"). http://www.dec.ny.gov/docs/materials_minerals_pdf/crumbrubfr.pdf (accessed May 30, 2009).

[25] *Review of the Human Health & Ecological Safety of Exposure to Recycled Tire Rubber found at Playgrounds and Synthetic Turf Fields,* ChemRisk, Inc., July 17, 2008. http://www.rma.org/getfile.cfm?ID=68&type=release (accessed May 26, 2009).

[26] CIWMB Report at 1.

[27] ***Id.*** at 2.

[28] NYC DOHMH Report at ES-5.

NYC DOHMH Report also found that since rubber has heat absorbing properties, education is necessary for users of synthetic turf fields about heat-related illness and dehydration and measures to prevent them. As well, the report countered concerns about potential bacterial or microbial growth potential in synthetic turf fields by finding that "that synthetic turf systems are not a hospitable environment for microbial activity."[29] The study evaluated the incidence of injuries on both conventional grass fields and synthetic turf fields. The report showed no significant difference in injuries overall but noted an increased risk of abrasion injuries on artificial turf fields and advised proper treatment of those injuries.

The NYSDEC/NYSDOH Report, published just as this report was going to press, concludes that there are no major environmental or public health concerns associated with synthetic turf fields. The study involved air, water and heat sampling and evaluation of artificial turf fields at sites in New York City. The study included laboratory chemical analyses of crumb rubber samples, a risk assessment for aquatic life, a field sampling of surface and ground water to assess environmental impacts, a field assessment of chemical releases from artificial turf surfaces and a public health evaluation on the results of the ambient air sampling.

The NYSDEC/NYSDOH study presented several important findings. First, found no significant concern from chemicals leaching into groundwater due to absorption, degradation and dilution in the water table.[30] Second, lead concentrations in crumb rubber are well below the federal hazard standard for lead and that crumb rubber "would not be a significant source of lead exposure if used as infill material in synthetic turf fields."[31] Third, ambient air sampling "concluded that the measured levels of chemicals in the ambient air at the [studied fields] do not raise a concern for non-cancer or cancer health effects for people who use or visit the fields."[32] Further, synthetic turf fields are not "significant source of exposure to respirable particulate matter."[33] Fourth, the report found little difference in surface heating indicators among the various types of surfaces studied (sand, grass, synthetic turf) but found that synthetic turf surfaces can get hotter than other surfaces and advised vigilance to properly treat heat related injury and illness.[34] The study noted that awareness should be raised about this issue to adults involved in play on these fields, including coaches and parents.

The RMA Report evaluated the potential health and ecological risks associated with the use of rubber crumb in consumer applications, particularly playgrounds and athletic fields, through a thorough review of the literature. This review included studies from both advocates and opponents to the use of rubber crumb and concluded that no adverse human health or ecological health effects are likely to result from these beneficial reuses of tire materials.

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29 ***Id.,*** at ES-4.

30 NYSDEC/NYSDOH Report at 1.
31 *Id.*
32 *Id.* at 3.
33 *Id.*
34 *Id.*

Rubber Playgrounds and the Americans with Disabilities Act (ADA)

Over the last two years two another obstacle facing rubber playgrounds has arisen. Concerns about compliance with Americans with Disabilities Act (ADA) and heating of rubber playground surfaces are being discussed in the ASTM International F08.63 Subcommittee on Playground Surfacing Systems.

The Americans with Disability Act (ADA) requires that there is access to all facilities for all persons. The test used to determine whether a surface material complies with the ADA has been ASTM 1951. Loose fill rubber playground material made from scrap tires passed the ASTM 1951 test, and hence were allowed to be used in and around outdoor playground equipment in compliance with the ADA.

Recently the Access Board, an independent Federal agency "devoted to accessibility for people with disabilities,"[35] was directed to find an in-field testing device that would test cover materials in playgrounds. The Access Board supports use of a device called the Rotational Penetrometer (RP) for this purpose. This device can be used in the field, but questions have been raised about whether the device and test method accurately simulates the ASTM 1951 test and whether it is an accurate measurement of accessibility.

Of note, the trial test results performed by the Access Board have not been reproducible by other testing laboratories, a critical acceptance factor for all ASTM standards. In trials, loose fill rubber playground material has not passed the tests using the RP. If the RP were to be adopted as part of and updated ASTM standard, the practical effect would be to eliminate use of loose fill rubber in playground construction. The RP is manufactured by a single supplier, and ASTM standards are not designed to promote or mandate a proprietary technology. This matter is currently being discussed at the ASTM F08.63 committee; no time table has been set for resolution of this matter.

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

[35] ***See***, http://www.access-board.gov/about.htm, accessed May 11, 2009.

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. Missouri, Washington and Nevada used RAC for road noise abatement projects in 2006 and 2007, but no reports have been released as to their effectiveness yet.

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.

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Civil Engineering Applications

The use of scrap tires in civil engineering applications continues to be impacted by the increased demand for tire-derived fuel, horticultural applications and ground rubber. For the fourth consecutive year, use of tire-derived aggregate (TDA) in civil engineering applications has decreased. In 2007, 560 thousand tons of scrap tires were used in civil engineering applications. This is a decrease of 12.5% percent from the 2005 level, when 640 thousand tons of scrap tires were used in civil engineering applications.

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.

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***

Table 6: Properties of TDA Used in Civil Engineering Applications

TDA is used primarily in seven states (New York, California, South Carolina, North Carolina, Minnesota, Virginia and Ohio). The more prevalent uses for TDA are as a medium in septic fields (North Carolina and South Carolina), road construction (Minnesota) and in landfill construction (Virginia, Ohio and New York).

In two of three states (Ohio, New York and Virginia, the use of TDA is a function of the state's stockpile abatement program. This will further impact the future use of TDA, since both Virginia and Ohio are close to completing the abatement of all their major piles, while New York is in the middle of their process. It is also unlikely that current end users of TDA in Virginia and Ohio will continue to use TDA to any great extent due to the differences in the economics between receipt of abatement tires and consumption of TDA from the annual generation.

The short-term outlook for TDA is further dimmed considering that 27 states report no known use of TDA. Opportunities exist to introduce TDA into several key states, especially when/where no other large-scale market currently exists. One of the major programs of the TDA subcommittee of the EPA's Resource Conservation Challenge Scrap Tire Partnership is to create an educational video on TDA, and through a network of state scrap tire regulators and market development personnel, work with potential end users to create opportunities for this material. If this program is successful, the use of TDA could begin to expand after another two years of contraction.

In order to understand the market conditions impacting the use of TDA, the following information appeared in the last 8th biennial market report but still remain operative at this writing.

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 should 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.

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.

Over the last two years, the volume of scrap tires baled remained virtually the same from 2005 to 2007. In 2007, about 40 thousand tons of scrap tires were reported to have been baled, as opposed to 42.2 thousand tons in 2005. It is important to note, however, that these figures do not represent the volume of baled tires entering markets.

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.

In 2007, eight states reported tire baling activities – Arizona, Colorado, Montana, New Mexico, New York, Pennsylvania, Texas and Washington. Of these states, all but Montana report that the baled tires were used in market applications. Montana reports that baling tires was used as a means of storage. The tons of baled tires used in market applications are included in the civil engineering market totals, while the tires baled for storage are listed separately as “Baled Tires” and not included in the market totals. Figure 10 shows the distribution in baled tires between markets and disposal or storage.

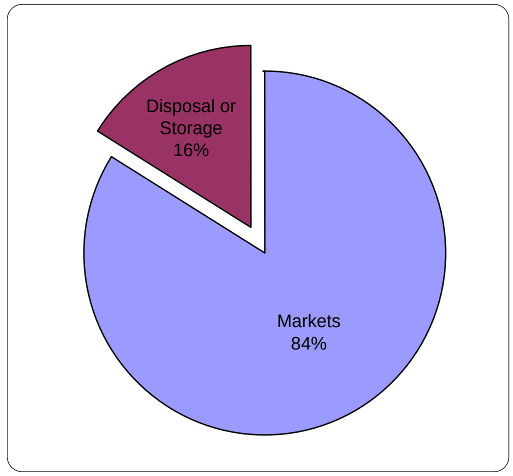

Figure 10: Baled Tires in the United States, 2007.

There have been several successful applications of tire bales. In each case, the use of tire bales was incorporated into a project that was designed and managed by a professional engineer. The seven states reporting tire baled in markets provided information about the particular market uses employed. The list is included in Table 7. While scrap tire bales have been used as fences for some time with mixed success, some states reported uses in fences and retaining walls that included engineered walls with tire bales filled with sand and encased in stucco. Experience in the next several years will show whether these are viable and sustainable long term uses for scrap tires in baled form.

State	Description of Uses of Baled Tires
Arkansas	They are used in the construction of a dam and for the building of a baled tire house.
Colorado	Fences and wind barriers
New Mexico	Retaining walls, fences, and bank stabilization at ephemeral streams
New York	Chautauqua County created and utilized 312 bales (100 passenger tires per bale) in 2007 for road construction projects under its BUD. Source of tires: annual flow. Washington County has a similar BUD but reported not utilizing any tire bales in 2007.
Pennsylvania	Road construction for poorly drained roads.
Texas	fences and erosion control projects
Washington	Road base, noise barrier

Table 7: Market Uses for Baled Tires, 2007.

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 an 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.

Market Outlook

RMA projects that the civil engineering market for scrap tires will continue to contract unless civil engineering uses begin in states that have to date not employed them. As stated in the 8th biennial report, competition for scrap tires between the TDF and civil engineering markets will continue wherever and whenever the demand for TDF or ground rubber increases.

Considering the lack of progress in expanding TDA markets to new states, civil engineering markets are not expected to expand significantly over the next two years. At present, only two states (California and New York) have active TDA market development programs. Finally, the EPA Resource Conservation Challenge Scrap Tire Partnership TDA Subcommittee's market development effort is still a work in progress that will require another year or two to achieve its goals. These factors suggest no dramatic resurgence in TDA usage over the next two year.

6

Electric Arc Furnaces

In 2007, 27.1 thousand tons of scrap tires were used as a charging material in three electric arc furnaces, compared to 18.9 thousand tons in 2005. This represents an increase of 44 percent since 2005. While this is a significant percentage increase, the long term growth prospects for this market remain limited.

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 of 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.

The overall market has not reached the level that the RMA first projected in the 2003 market report. RMA down graded its forecast on the use of tires in EAFs for the period 2006 -2007, which projected that the use of tires in EAFs would not be a major market factor. This assessment remains sound.

While our research indicates that up to eight additional EAFs still 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.

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, EAFs are located in rural areas, 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 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 current market conditions, it is anticipated that an additional EAF may begin using tires as a charge material over the next two years.

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.

7

Other Markets

Cut, Punched and Stamped Rubber Products

RMA data show that 1.9 thousand tons of scrap tires were used in cut, punched and stamped rubber products in 2007. RMA did not receive detailed information about this market, so these data represent a rough estimate only.

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 used tires with usable tread continues. RMA estimates that 102.1 thousand tons of scrap tires were exported in 2007, as compared with 112 thousand tons in 2005. It is difficult to obtain detailed data about this activity. 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 7.1 thousand tons of tires in 2007.

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. In 2007, about 70.8 thousand tons of scrap tires were used in reclamation projects in the United States. Reclamation projects were reported in four states: Arkansas, Nebraska, New Mexico and Texas. Figure 11, below, shows the relative usage in of scrap tires in land reclamation projects by these states.

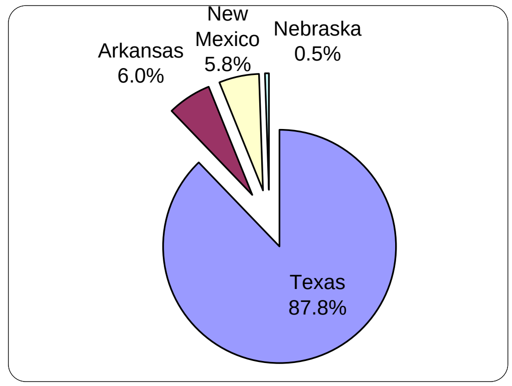

Figure 11: Geographic Distribution of Land Reclamation Projects in the United States using Scrap Tires, 2007.

Tire Pyrolysis

Continuing interest exists in thermal distillation, or pyrolysis, of scrap tires as a strategy to manage scrap tires. Over the last two years several companies were formed for the express purpose of bringing this technology to a commercially viable state. At the end of 2007, RMA is not aware of any commercially viable tire pyrolysis facilities operating in the United States. The objective of this discussion is to identify the issues that impact potential markets for the technologies that can use scrap tires.

“Pyrolysis” is the use of heat in the absence of oxygen to decompose a material. As a basic chemical technology, it has been known since the time of the ancient Greeks. Initial interest in tire pyrolysis began as a result of the world-wide concerns continued petroleum supply in the 1970s. Pyrolysis was pursued as a method to liberate the liquid hydrocarbons in the tire.

The first scrap tire market report funded by RMA (1990) stated that given the (then) current economics, pyrolysis was not economically viable, but that the break-even point was at $0.60 - .99 per gallon of oil ($25.20 – 41.58 per barrel of oil).[36] Over the past two years the price of a barrel of oil reached an all-time high, over $150 per barrel. Even with oil prices at an all-time high the market did not support this technology.

One of the conclusions that can be drawn is that using the price of a barrel of oil might not be the best indicator of whether tire pyrolysis will or will not be economically viable. The rationale of analysis in the 1990 report was that the price of oil impacted the prices of all petrochemicals, and the byproducts from tire pyrolysis were basically petrochemical in nature.

Now that record oil prices have subsided, and tire pyrolysis has still not taken hold, we believe that a better economic indictor to judge the economic viability of pyrolysis would be to look at the prices of the materials which the byproducts of the pyrolysis system is competing against. These products would include, but would not be limited to off-specification carbon black, charcoal and waste oils, since these are the materials most often mentioned as possible end uses by the developers of these systems.

Pyrolysis technology does work, in the sense that tires can be pyrolyzed and the tire converted to three by-products: a gas, a liquid and a solid. Whether pyrolysis can be more than a technological curiosity depends on the availability of potential markets for the by-products.

Methane gas produced during pyrolysis can be used to provide the heat necessary to operate the pyrolysis facility. However, the process produces insufficient gas volumes to sell economically, so excess gas typically is flared off.

The solid fraction produced during pyrolysis is pyrolytic carbon char, often incorrectly referred to as carbon black. Pyrolytic carbon char has a high carbon content but is otherwise dissimilar to carbon black, a highly engineered product. Pyrolytic carbon char, after extensive refining, has found a limited market as a filler in some materials and as a coloring agent for some plastics. In these markets it faces strong competition from, among other things, off-specification carbon black which cannot be sold to primary carbon black markets.

The liquid fraction from the pyrolysis process is a hydrocarbon material variously often compared to home heating oil or a diesel fuel. While synthetic rubber is manufactured from petroleum, contaminants resulting from the processing of the material and its pyrolysis render the liquid generally unfit to use directly, except as a waste fuel or as a feedstock for further refining. Its acceptability in either application depends on the receiving facility's ability to handle the material.

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[36] ***Scrap Tire Management Council Scrap tire Use/Disposal Study: Final Report***, A.T. Kearney, September 11, 1990, 3-2, 3-4.

To date, even experimental pyrolysis facilities have had limited success in identifying end-users for the liquid fraction.

Outlook

Recently, RMA has become aware of a tire pyrolysis concern that has refined its solid byproduct and is currently testing this material in commercial products. Given the recent spike in the prices of natural rubber and other carbon based products, there could be an economic window of opportunity for this technology. However, given the results of the market research, tire pyrolysis, at the end of 2007 was not a factor in the overall management of scrap tires in the United States.

8

Land Disposal Issues

In many states, the management menu 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.

Figure 12 shows the total number of states that allow landfilling of whole scrap tires, landfilling of cut or shredded scrap tires and scrap tire monofills.

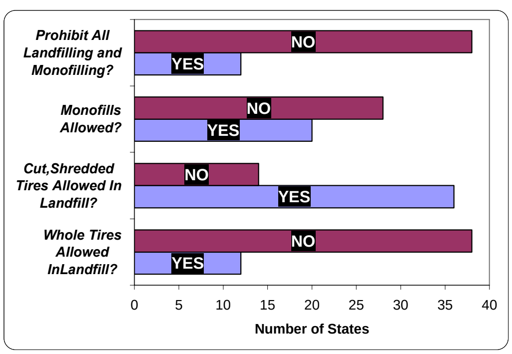

Figure 12: Summary of State Regulations on Scrap Tires in Landfills and Monofills.

Tires Land Disposed in 2007

In 2007, about 594.0 thousand tons of scrap tires were landfilled in the United States. This compares to the 477.2 thousand tons that were reportedly landfilled in 2005. These data indicated an increase in scrap tire landfilling in the last two years. The increase can be primarily attributed to active scrap tire stockpile remediation efforts in a number of states.

As discussed in more detail below, when tires are land disposed, they are either discarded in a landfill or a monofill (a landfill with only scrap tires). For 2007, RMA documented the relative percentage of tires disposed in landfills versus monofills. That analysis is presented in Figure 13.

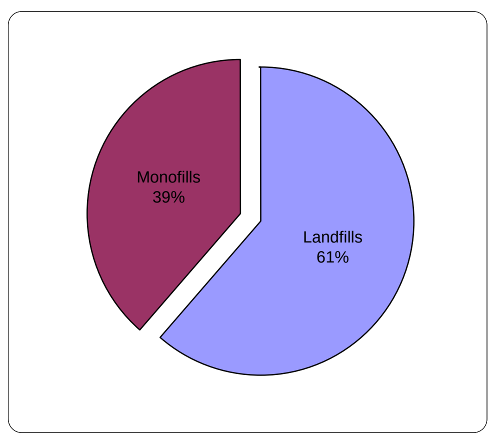

Figure 13: Land-Disposal of Scrap Tires in the United States, 2007.

While this analysis gives a good estimate of the relative percentage of scrap tires being monofilled, it must be noted that at least one state does not differentiate between landfilling and monofilling in its public reporting. In California, Azusa

Land Reclamation (ALR), a Waste Management Company, operates a tire monofill in southern California that landfills significant volumes of tires annually.

Landfills

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 further developed for these materials.

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 2007, ten states reported monofilling tires: Arkansas, Colorado, Idaho, Louisiana, Mississippi, Nebraska, North Carolina, North Dakota, Ohio, Oregon and West Virginia. Table 8 shows the volumes of scrap tires monofilled in each of these states in 2007.

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.

State Name	1000's of Tons
Arkansas	9.1
Colorado	14.8
Idaho	9.3
Louisiana	9.3
Mississippi	5.2
Nebraska	6.3
North Carolina	61.0
North Dakota	0.5
Ohio	10.5
Oregon	10.9
West Virginia	92.5
TOTAL	**229.2**

Table 8: Volume of Scrap Tires Placed in Monofills, 2007.

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.

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 2007

At the end of 2007, state regulatory agencies reported that 128.36 million scrap tires remain in stockpiles, a reduction of million tires (percent) from 2005. Figure 14 shows the reduction in the number of scrap tires in stockpiles since 1990. Appendix B shows state estimates of the numbers of tires remaining in stockpiles in the U.S. State data collected by RMA indicate that scrap tire stockpiles are concentrated in a small number of states. Figure 15 shows the geographic distribution of the scrap tires remaining in stockpiles. Figure 16 shows the progress in eliminating stockpiled tires achieved by states in each U.S. EPA Region since 1994.

The remaining stockpiles are concentrated in seven states: Alabama, Arizona, Colorado, Massachusetts, Michigan, New York and Texas. These states contain over 85 percent of the scrap tires remaining in stockpiles. Of these states, Alabama, Michigan and New York have ongoing abatement programs. Texas completed an abatement effort in 2007. Arizona has not reported any tires in stockpiles for several years, but it has recently documented an active stockpile in the state.

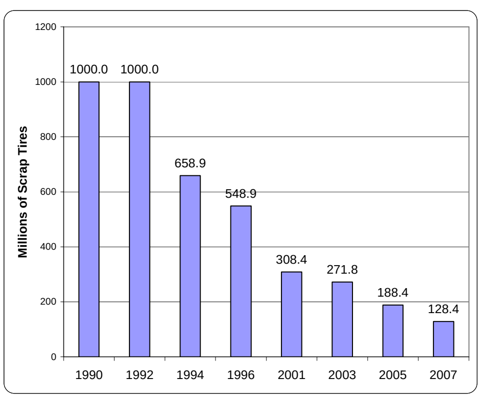

Figure 14: Millions of Scrap Tires Remaining in U.S. Stockpiles, 1990 – 2007.

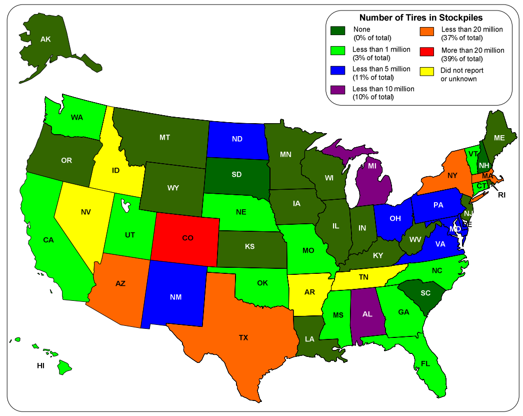

Figure 15: Distribution of Scrap Tires Remaining in Stockpiles in the United States, 2007.

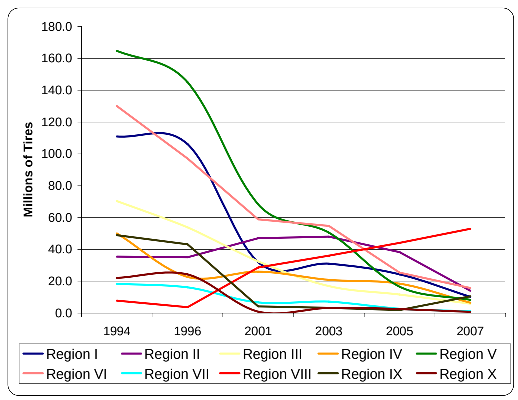

Figure 16: U.S. Scrap Tire Stockpile Reduction Trends by U.S. EPA Region, 1994 - 2007.

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 2005 and 2007. Ohio, Virginia, Michigan, Pennsylvania and Washington should complete abatement programs within the next two years; this should remove some 13.5 million scrap tires from stockpiles. New York and Alabama are anticipated to continue to make progress, which could remove up to an additional 9 million tires. The combination of these actions could reduce the total of tires in stockpiles to around 106 million tires.

In a best case scenario of tire abatement progress, by the end of 2009, over 85 percent of the remaining stockpiled tires would be in five states (Colorado, New York, Texas, Arizona and Massachusetts). The majority of the stockpiled tires that could be abated will likely be abated at this point. Unfortunately, 75 percent of the remaining stockpiled tires will continue since none of these states have active scrap tire programs.

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

U.S. Regional Scrap Tire Market Analysis

The markets for scrap tires continue to be regionally based, although tire flow either to the processor or to the end user is not limited to these regions. Due to the dynamics of the market, the distances traveled to collect tires and to ship finished products is both increasing and changing. 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.

Review of state market percentages reveals the market trends seen in the various regions across the country. Figure 17 graphically illustrates the percent of scrap tires generated going into end-use markets for all the states.

Figure 18 shows the relative percentage of scrap tires going into end-use markets in each U.S. EPA Region in 2007.

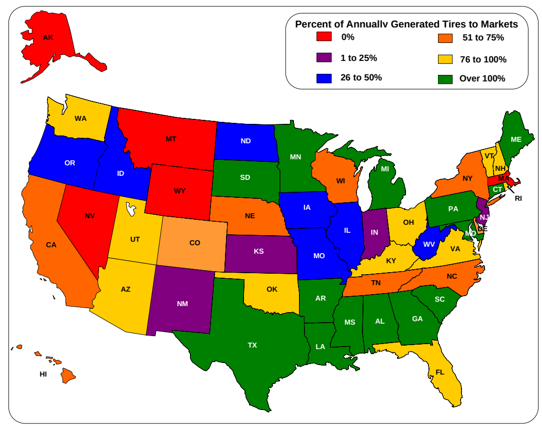

Figure 17: State Percentages of Scrap Tires Going into End-use Markets, 2007.

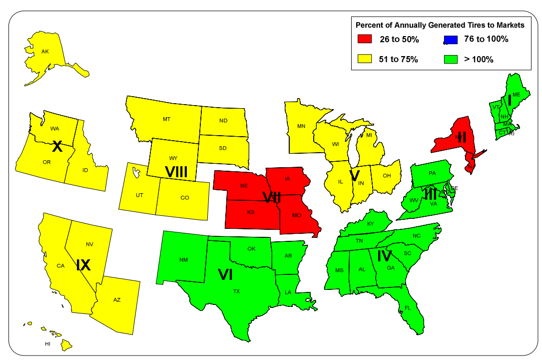

Figure 18: Percentage of Total U.S. Scrap Tires to Market by U.S. EPA Region, 2007.

Generally, scrap tire markets in the eastern half of the U.S. remain strong. If you were to draw a line from the Western boundary of Texas to the Western side of Minnesota – east of that line, with a few isolated exceptions, enjoys a situation where demand for tire-derived products equals the supply of scrap tires.

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.

While the demand for tire-derived products and the supply of tires is at a point of equilibrium, this is not to suggest that the markets or demand are evenly distributed across this portion of the country. The market dynamic is such that scrap tires are being collected in this entire portion of the country, brought to tire processing facilities and then transported to those markets that each processor has. These markets may or may not be close to the processors facility. It is not the intent of this report to specify which processors are supplying which markets. The intent of this report is to analyze the overall market conditions.

The scrap tire situation in the Western half of the country is still characterized by a few states with strong markets that attract tires from adjoining states. The overall market condition on the West Coast has improved over the last two years, but the Rocky Mountain and Plains states still have generally 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.

U.S. EPA Region I

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

There has been little change in this region. 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 19 shows the disposition of scrap tires in U.S. EPA Region I. Figure 20 shows the scrap tire market trends for 2005 to 2007.

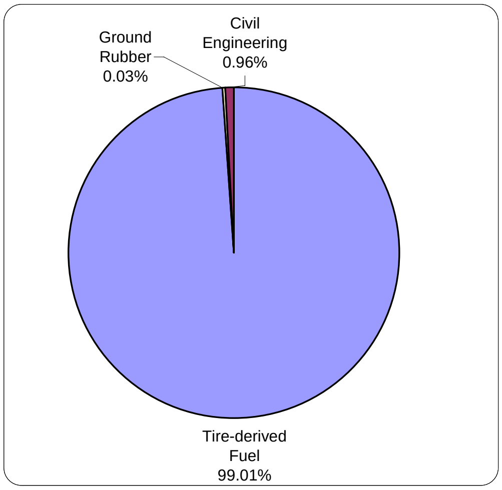

Figure 19: U.S. EPA Region I Scrap Tire Disposition, 2007.

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.

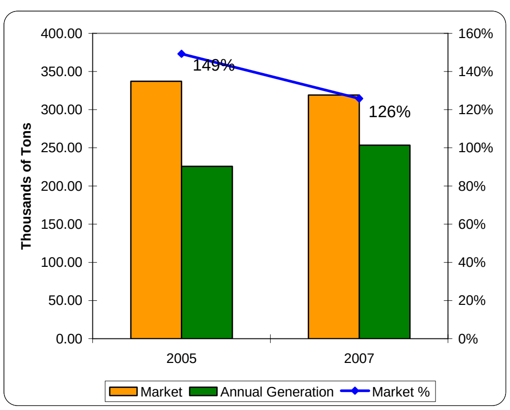

Figure 20: U.S. EPA Region I Market Comparison, 2005 - 2007.

Very few historical scrap tire stockpiles remain in EPA Region I. Although significant stockpiles existed in the region until the mid 1990's, the states in the region have remediated most of the stockpiled tires. About 10 million tires remain stockpiled in the region, all in Massachusetts. Figure 21 shows the scrap tire stockpile trends in EPA Region I from 1994 – 2007.

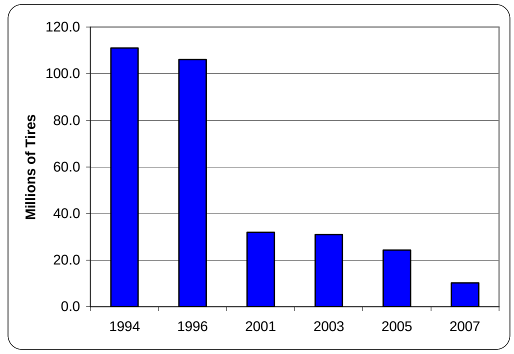

Figure 21: U.S. EPA Region I Scrap Tire Stockpile Trends, 1994 - 2007.

U.S. EPA Region II

New York and New Jersey

Scrap tire markets have been strengthened in U.S. EPA Region II. Figure 22 shows the disposition of scrap tires in U.S. EPA Region II. Figure 23 shows the scrap tire trends in Region II between 2005 and 2007.

Even though there are no large-scale markets in New Jersey, there is a significant amount of tire processing in the state. This, in combination with a significant percentage of tires being taken into other states, the scrap tire situation in New Jersey is stable. Tires in southern New Jersey are picked up and transported into Maryland or Delaware, while many tires from the northern part of the state go into Connecticut or Pennsylvania.

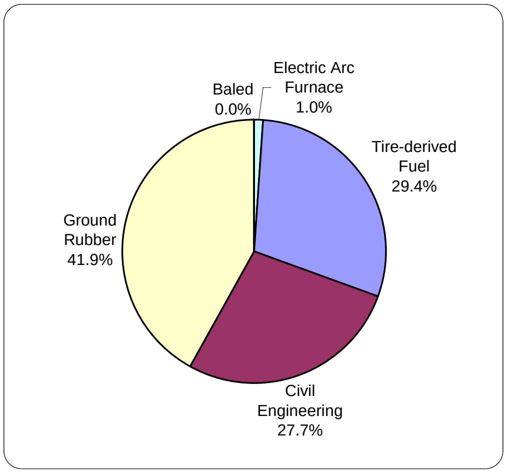

Figure 22: U.S. EPA Region II Scrap Tire Disposition, 2007.

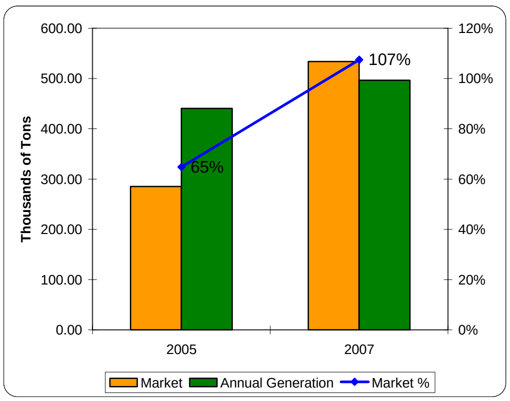

Figure 23: U.S. EPA Region II Market Comparison, 2005 – 2007.

Scrap tire legislation enacted in 2006 in New Jersey was designed to focus on stockpile abatement, but there are still 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.

In New York, the scrap tire situation is much improved: there are two large-scale TDF end users, multiple ground rubber producers and an electric arc furnace using tires. Additionally the use of TDA has increased with several landfills using the material. Moreover, the State is funding an effort to expand the use of TDA in home construction and septic field drainage medium: two untapped potential markets in the Northeast. Tires in the eastern corridor are transported to Connecticut for use in the dedicated tire-to-energy facility.

EPA Region II has seen a significant reduction in the number of scrap tires in stockpiles during this period. New York enacted a funded scrap tire management program in 2002. The state began to abate stockpiles and developed a scrap tire marketing plan. Over the last two years the State has abated a substantial number of stockpiled tires and has developed a substantial network of ground rubber producers. Figure 24 shows the reductions in tires in stockpiles in EPA Region since 1994.

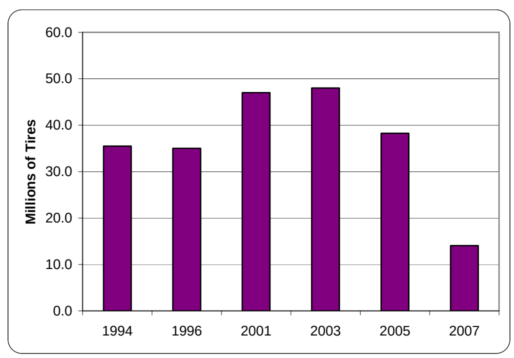

Figure 24: U.S. EPA Region II Scrap Tire Stockpile Trends, 1994 - 2007.

U.S. EPA Region III

Delaware, Maryland, Pennsylvania, Virginia and West Virginia

U.S. EPA Region III has varied scrap tire programs. Figure 25 illustrates the market diversity in this region. Figure 26 shows the trends in markets in U.S. EPA Region III in the period 2005 – 2007.

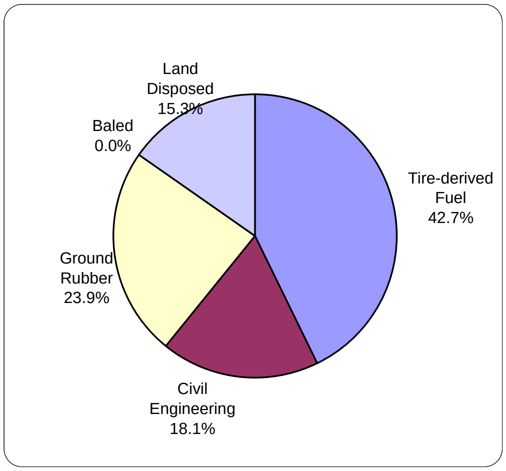

Figure 25: U.S. EPA Region III Scrap Tire Disposition, 2007.

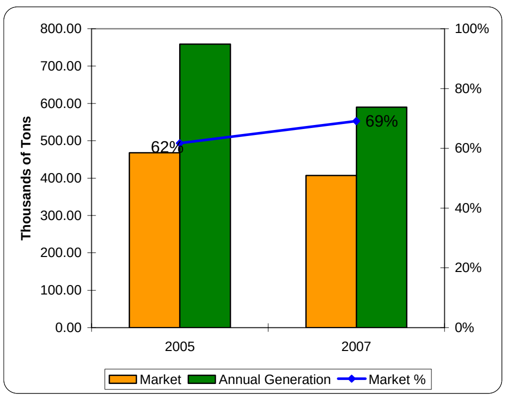

Figure 26: U.S. EPA Region III Market Comparison, 2005 – 2007.

Maryland has an effective 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, Delaware and New Jersey.

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.

U.S. EPA Region III has shown steady progress in eliminating scrap tire stockpiles. In 2007, fewer than six million scrap tires remained in stockpiles. Figure 27 shows the reduction trend in this region since 1994.

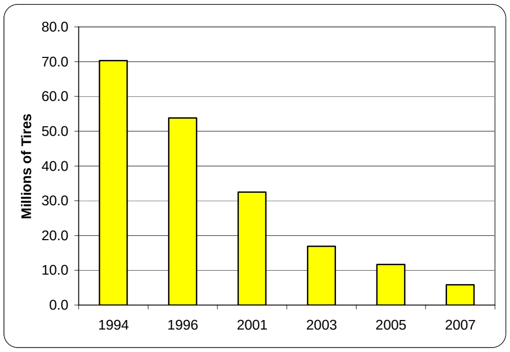

Figure 27: U.S. EPA Region III Scrap Tire Stockpile Trends, 1994 – 2007.

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 28 shows the scrap tire disposition in Region IV in 2007.

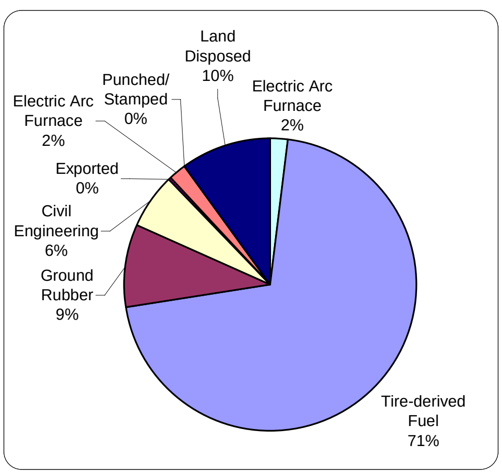

Figure 28: U.S. EPA Region IV Scrap Tire Disposition, 2007.

Some of the annually-generated scrap tires are landfilled or monofilled. For example, Alabama and North Carolina 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 increased over the last two years. Still, 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 very strong TDF market that is starting to slow the flow of tires to the major monofill in the state. Alabama is home to three 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. Aside from a relatively small amount of tires going to an electric arc furnace, 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. There is also a relatively large producer of tire mulch in the state.

Figure 29 shows market trends from 2005 to 2007.

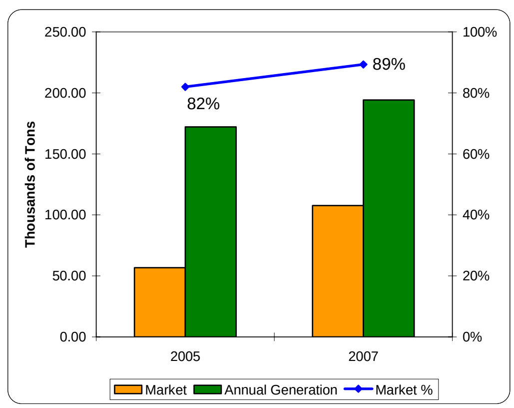

Figure 29: U.S. EPA Region IV Market Comparison, 2005 – 2007.

The states in U.S. EPA Region IV have reduced steadily the number of scrap tires in stockpiles. In 2007, 6.5 million scrap tires remained in stockpiles in the region, with 6 million of those tires in Alabama. Figure 30 shows the stockpile reductions in the region since 1994.

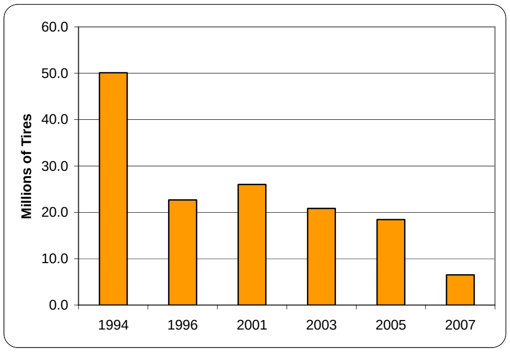

Figure 30: U.S. EPA Region IV Scrap Tire Stockpile Trends, 1994 – 2007.

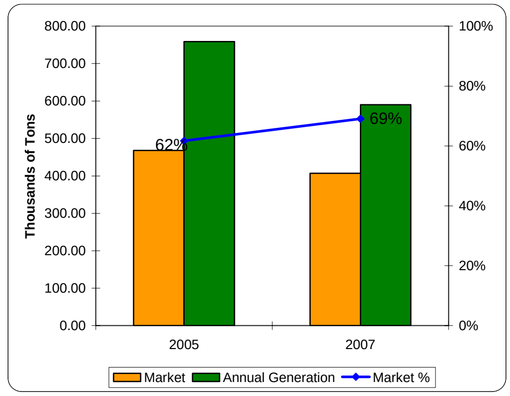

Figure 31: U.S. EPA Region V Market Comparison, 2005 – 2007.

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 31 shows the various scrap tire markets in Region V in 2007.

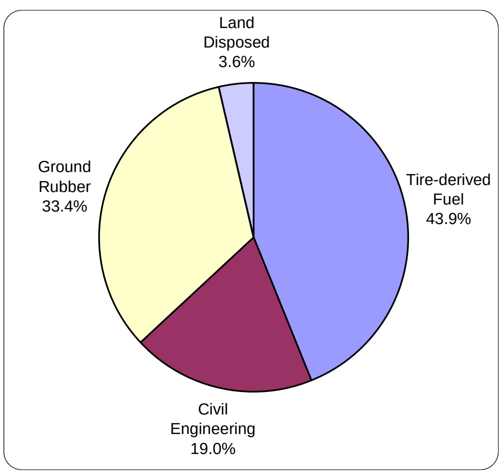

Figure 31: U.S. EPA Region V Scrap Tire Disposition, 2005.

Figure 31 shows a scrap tire summary for U.S. EPA Region V, comparing 2005 and 2007.

While there are few major markets for scrap tire in Ohio, there is an effort to expand 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, Minnesota and Wisconsin.

Illinois has not recovered from the loss of several in-state TDF users, but did regain 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 further developed its 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.

Scrap tire stockpiles in the region have been nearly all eliminated, with 6.5 million remaining in Michigan and less than two million remaining in Ohio. Figure 32 shows the stockpile reductions since 1994.

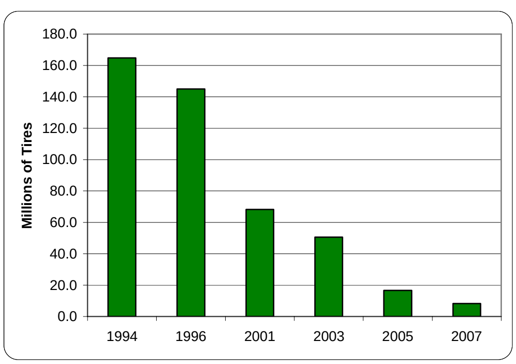

Figure 32: U.S. EPA Region V Scrap Tire Stockpile Trends, 1994 – 2007.

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 33. Figure 34 shows scrap tire market trends in the period 2005 – 2007.

Arkansas tires are shipped into markets in bordering states. Remarkably, Arkansas also receives a considerable amount of their TDF from out-of-state suppliers.

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.

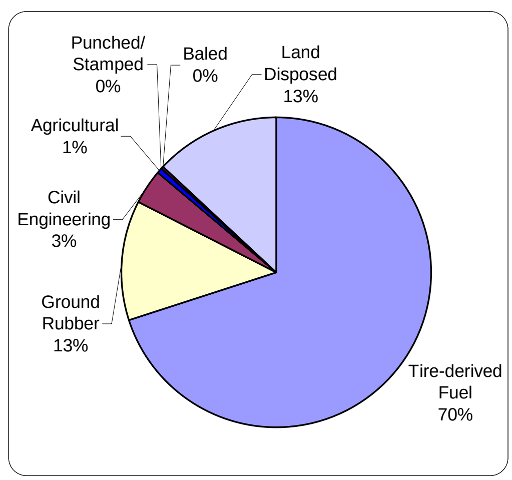

Figure 33: U.S. EPA Region VI Scrap Tire Disposition, 2007.

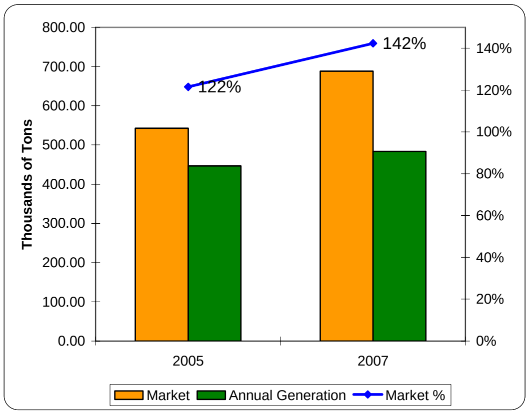

Figure 34: U.S. EPA Region VI Market Comparison, 2005 – 2007.

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.

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 find uses for the baled tires in civil engineering applications. The state has attempted to develop 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.

Stockpiles in U.S. EPA Region VI have been actively eliminated by states since 1994. Just under 16 million scrap tires remain in stockpiles remain in the region, with 14 million of those tires in Texas. Figure 35 shows the reductions in stockpiled tires since 1994.

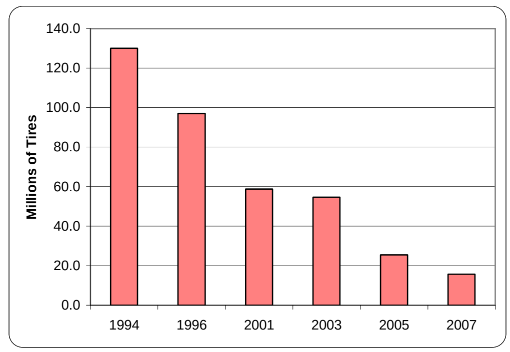

Figure 35: U.S. EPA Region VI Scrap Tire Stockpile Trends, 1994 – 2007.

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 36 shows the scrap tire market distribution in U.S. EPA Region VII.

Iowa has lost its TDF market, but has a major tire processor in the state that collects and processes the State's scrap tires, which then are transported to other regions for various markets. Missouri still 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, even though the state has lost several TDF end users. 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.

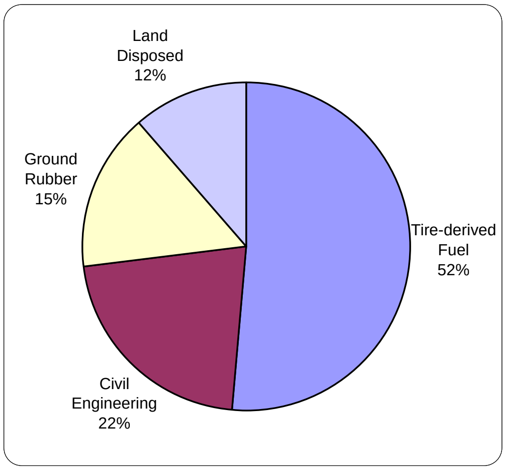

Figure 36: U.S. EPA Region VII Scrap Tire Disposition, 2007.

Nebraska is shifting the focus of its scrap tire program. The cement kiln that obtained its permit to use TDF has yet to begin using TDF, so the supply of tires in Nebraska are being collected and transported to adjacent states for processing and then sent to various markets in the region.

Figure 37 shows comparative market data for U.S. EPA Region VII in 2005 and 2007.

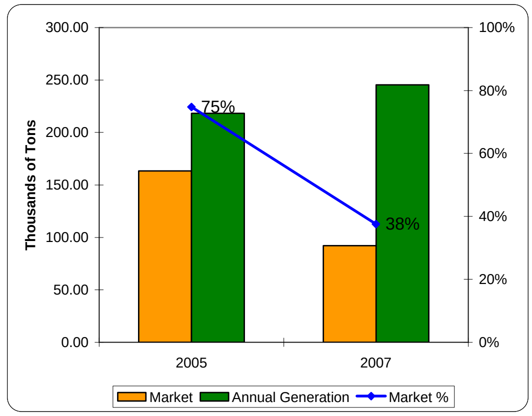

Figure 37: U.S. EPA Region VII Market Comparison, 2005 – 2007.

The states in U.S. EPA Region VII have eliminated most of the tires in historical stockpiles, as illustrated in Figure 38. In 2007, states reported that 1.2 million tires remain in stockpiles. These tires are located in Missouri and Nebraska. Iowa and Kansas reported no remaining tires in stockpiles.

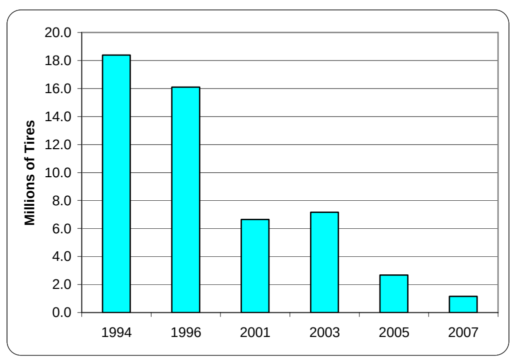

Figure 38: U.S. EPA Region VII Scrap Tire Stockpile Trends, 1994 – 2007.

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 39 shows the disposition of scrap tires in U.S. EPA Region VIII. Figure 40 shows the comparison of 2005 and 2007 data.

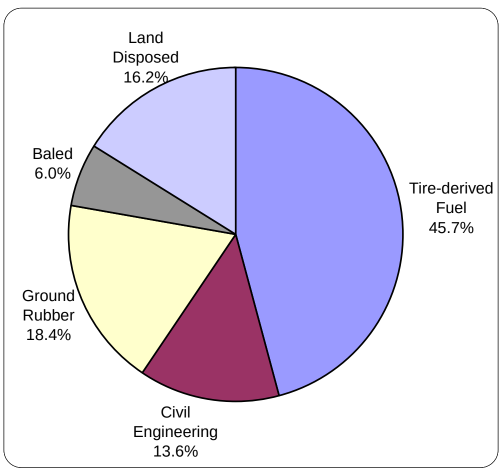

Figure 39: U.S. EPA Region VIII Scrap Tire Disposition, 2007.

Colorado still has been unable to develop self-sustaining markets in spite of a generous grant program. Markets in Colorado are limited to one cement kiln and one processor and manufacturer of coarse-sized particles for an array of products. Scrap tires are accumulating at landfills or are taken to the country's largest stockpile of tires for storage.

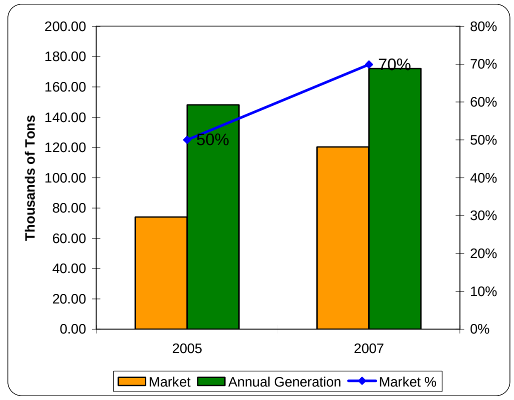

Figure 40: U.S. Region VIII Market Comparison, 2005 – 2007.

Utah subsidizes end-users of Utah-generated scrap tires and has one TDF user. Utah tires are collected and processed into products that are shipped to adjacent states. Wyoming primarily landfills scrap tires generated annually in the state; there is little likelihood of short-term market development.

The Montana scrap tire program still has been unable to develop markets. At present, the vast majority of tires are land disposed. Montana also enacted regulations banning baled tires, although there are baled tires in storage in the state.

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, but there has been movement on TDF in both states. There is a utility in South Dakota utilizing TDF and a possible TDF market in North Dakota.

Significant scrap tire stockpile challenges remain in U.S. EPA Region VIII. As illustrated in Figure 41, stockpile estimates in the region have been growing, rather than shrinking. This phenomenon is due largely to better estimation techniques. In Colorado alone, nearly 50 million scrap tires sit in stockpiles without an effective state scrap tire management program to address them. Absent a major shift in Colorado, the prospects are limited for reducing the number of stockpiled tires in the region.

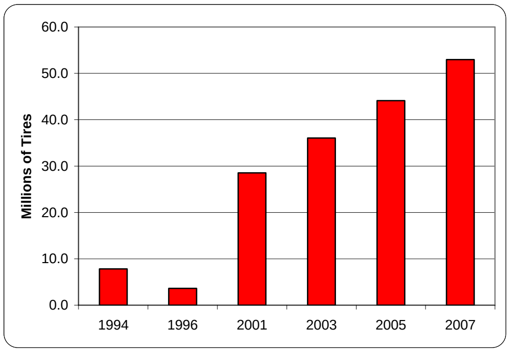

Figure 41: U.S. EPA Region VIII Scrap Tire Stockpile Trends, 1994 – 2007.

U.S. EPA Region IX

Arizona, California, Hawaii and Nevada

U.S. EPA Region IX has several areas with strong markets for scrap tires, including Arizona and parts of California and Hawaii. Other areas landfill the majority of scrap tires. Figure 42 shows the disposition of scrap tires in EPA Region IX. Figure 43 shows trends in scrap tire disposition between 2005 and 2007 in U.S. EPA Region IX.

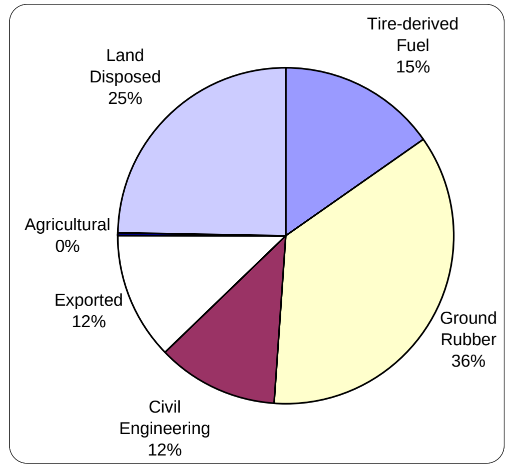

Figure 42: U.S. EPA Region IX Scrap Tire Disposition, 2007.

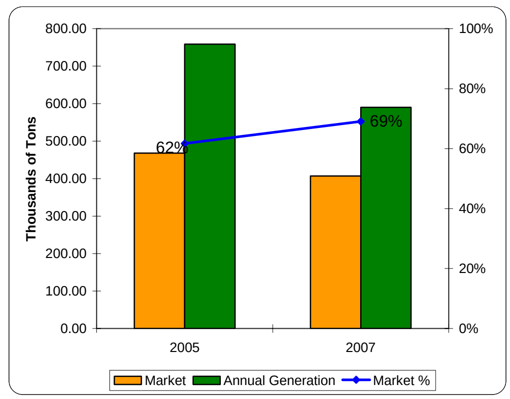

Figure 43: U.S. EPA Region IX Market Comparison, 2005 – 2007.

In Arizona, a consistent demand for rubber-modified asphalt continues, but no other markets have been developed. Excess ground rubber is being transported to other states for use in various markets. A portion of the scrap tires in the state are still transported into Southern California to be landfilled. Nevada's scrap tires continue to be landfilled in the absence of markets. In Southern California tires continue to be landfilled, although the numbers are reported to be lower than in previous years. The cost to landfill tires has risen while demand for ground rubber, TDF and TDA has increased. The combination of these factors can account for the decrease in the rate that California generated scrap tires are being land disposed. In central California there are some TDF markets, while civil engineering applications are remain in the beginning stages of market development. Rubber-modified asphalt has been used widely throughout the southern and central portions of the state, but continue to receive price support through a series of grants from the State. In Northern California, tires are used for fuel at a cement kiln or are landfilled.

In Hawaii, one relatively large-scale processor operates 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. In 2007, Hawaii reported that over 130,000 tires were transported to the mainland for disposition in landfills or use in markets.

Stockpiles in EPA Region IX have declined steadily until this reporting cycle. Arizona reported 10 million tires in stockpiles in 2007. The subject stockpile was the site of a scrap tire "processor" that went out of business. Although the scrap tires were on site for some time, the state and the processor considered these tires "inventory" until the company closed. The state is considering options to eliminate this stockpile. Figure 44 shows stockpile trends in the region since 1994.

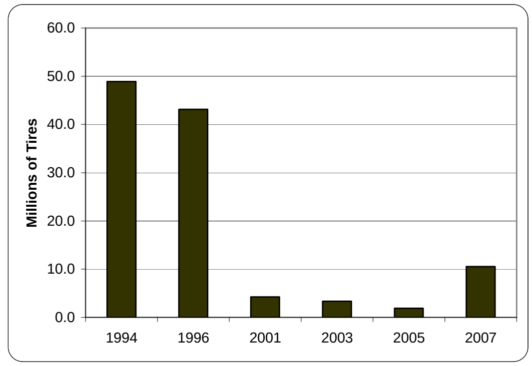

Figure 44. U.S. EPA Region IX Scrap Tire Stockpile Trends, 1994 – 2007.

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 45 shows the disposition of scrap tires in Region X in 2007. Figure 46 shows the scrap tire management trends in U.S. EPA Region X between 2007 and 2007.

Over the last two years industry's efforts to increase the use of tires as fuel and civil engineering applications have been successful. In both Washington and in Oregon, both these markets have increased, resulting a decrease in the number of tires landfilled. In Eastern Washington, Northern Idaho and Western Montana, a considerable number of tires are baled and inventoried. Scrap tires from Eastern Oregon, parts of Montana and central Idaho are sent to TDF markets in Eastern Oregon or central Idaho.

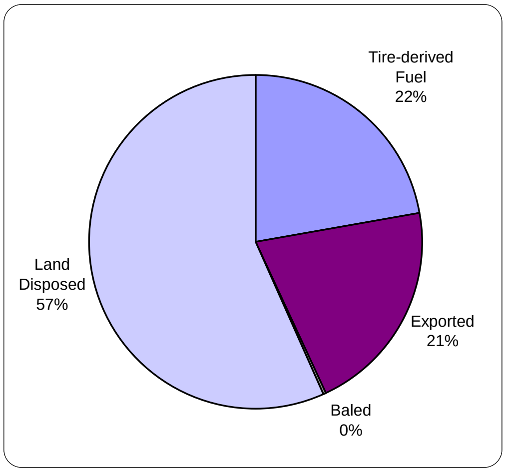

Figure 45: U.S. EPA Region X Scrap Tire Disposition, 2007.

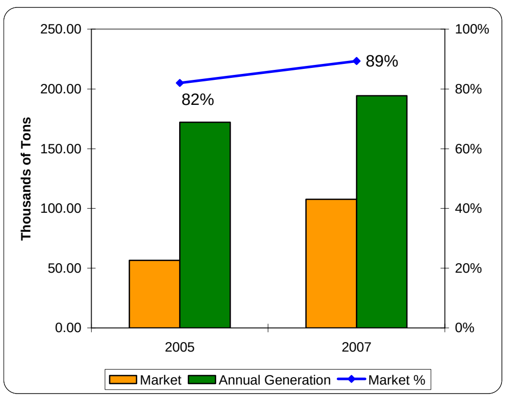

Figure 46: U.S. EPA Region X Market Comparison, 2005 – 2007.

Scrap tires in central and southern Oregon are used for ground rubber or combined with tires from Northern California for TDF in Northern California. The demand for TDF in Oregon is increasing with several end users beginning TDF use. Several civil engineering projects in Oregon have also occurred.

This region's market development efforts have been due to efforts of the scrap tire industry, since no state market development funds exist. Washington (1996), Oregon (1993) and Idaho (1996) terminated their fee programs. Washington reinstated a scrap tire fee but the funds are earmarked for stockpile abatement only.

Alaska's small population and vast geography makes managing scrap tires a challenge. Virtually all tires are landfilled. Previously reported projects have not materialized. Given high transportation costs and the abundance of landfill capacity it is unlikely that there will be any change in the management of tires in the foreseeable future.

In U.S. EPA Region X, the number of scrap tires in stockpiles continues to decline. Washington State cleaned up over three million tires in 2007 and plans to continue clean up efforts through 2010. Figure 47 shows stockpile reduction trends in the region since 1994.

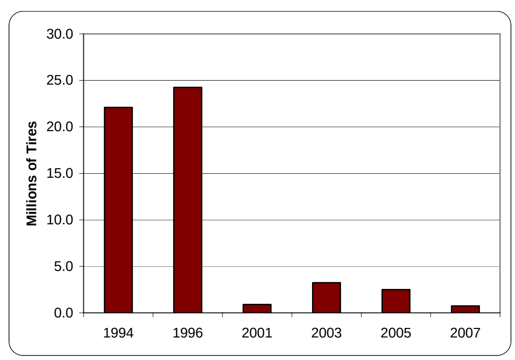

Figure 47: U.S. EPA Region IX Scrap Tire Stockpile Trends, 1994 – 2007.

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History of the Modern Scrap Tire Market

Editor's Note: This section largely constitutes a reprint of text from previous editions. Since the history of scrap tire markets is key to understanding current trends and drivers in the scrap tire marketplace, it is important to provide this history for the reader's background. The section was updated to reflect information regarding market trends discussed in the 2005 edition of this report.

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.

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 continued to expand, although this period saw the emergence of a new market leader in this segment – the sports surfacing market.

In the case of electric arc furnaces, this market did not expand with the vigor anticipated in the 2003 edition, due to realities in the steel manufacturing industry and intellectual property constraints.

In 2004 and 2005, 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.

As described in this report, scrap tire markets are dynamic in nature. As always, in order for scrap tire markets to remain sustainable, those involved must be nimble.

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Conclusions

This report details the changes to the scrap tire markets in 2006 through 2007. This period saw continued 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 continued 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 2006 and 2007. Scrap tires in stockpiles are at an all-time low of 128 million tires. Several states have now completed ambitious stockpile abatement programs, while several states have continued with their 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. One of the major lessons learned in this industry is that the demand for any one product can change very quickly, often due to circumstances that are well beyond the influence scrap tire industry itself. The scrap tire industry must remain focused and flexible to change with the market. We have witnessed states and companies fall into a sense of complacency, believing that they have sufficient markets and there is not need to develop other end use markets.

TDF markets saw continued increases, but the distribution of TDF changed; cement kilns are no longer the single largest destination for TDF. This change has dramatically altered the market dynamic, causing TDF producing companies to shift collection and processing strategies. As in past years, the expansion in TDF markets impacted the civil engineering markets. With the reduction in the supply of abatement tires this market could be further impacted in the coming years. 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. We are also witnessing increased pressure on the higher value added rubber product markets. We believe the pressure on these market applications will only increase as market competition increases.

While there have been changes in some of the market dynamics, these changes should no be viewed as negative. These changes are part of the continuing maturity of this industry.

The Stockpile Challenge

The overall reduction in tires in stockpiles since 1990 is something this industry should be proud of. The reduction in stockpiled tires since 2007 is also significant, going from 188 million to 128 million scrap tires.

While the progress in reducing stockpiles tires is very positive, we are continuously reminded of what remains to be done. In this case the remaining stockpiled tires fall into three general categories: states that have not abated their piles, states that are in the process of abating their major piles and states that have only a few, small, but difficult to get to piles. 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. What we are being to observe is that many states no longer have the funds to complete the abatement process or believe that the few remaining piles pose little environmental threat.

State Scrap Tire Program Maintenance

The number of states that have the enviable situation where most or all annually-generated scrap tires enter end-use markets, and most or all scrap tire stockpiles have been abated has increased since the last report. Here again, it could be tempting to declare victory and sunset successful state programs. Yet, to do so would invite new problems.

The evidence from observing the events at the state level shows that problems with scrap tires begin to reemerge shortly after tire fees are ended or when and where administrative oversight is reduced. There is a tendency for an increase in dumping, some stockpiling of tires and often a loss of positive inertia in the marketplace. In these cases, once a market is lost it becomes difficult to reestablish or expand markets. Over time the problems do tend to become more aggravated. In several cases, states had had to seek new legislation to reinstitute fees and programs to address these problems.

As stated in previous editions of this report, states should continue to play a vital role in a mature and thriving state scrap tire market. At a minimum, 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 will depend on a series of factors; each market will need to address the issues and threats that can challenge their viability. In general, the industry is taking action to answer these challenges, although we believe these challenges will continue to be a matter of urgency for the foreseeable future.

Yet, the indications are that there should be continue growth in the demand for TDF. In the ground rubber market the expectation is for continued growth, although not all ground rubber applications will experience any growth. Any growth in the demand for TDA will probably require another couple of years to take hold before any significant improvement is seen. Stockpile abatement is expected to continue, although it will be limited to only a few states.

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Appendices

APPENDIX A: Scrap Tire Management Trends, 1990 - 2005

APPENDIX B: 2007 U.S. Scrap Tire Market Data Tables

APPENDIX C: 2007 Tire-Derived Fuel Users

APPENDIX D: U.S. Scrap Tire Stockpiles Historical Data 1990 - 2007 (in millions of scrap tires)

APPENDIX E: State Scrap Tire Programs Summary

APPENDIX A: U.S. Scrap Tire Management Trends 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.*

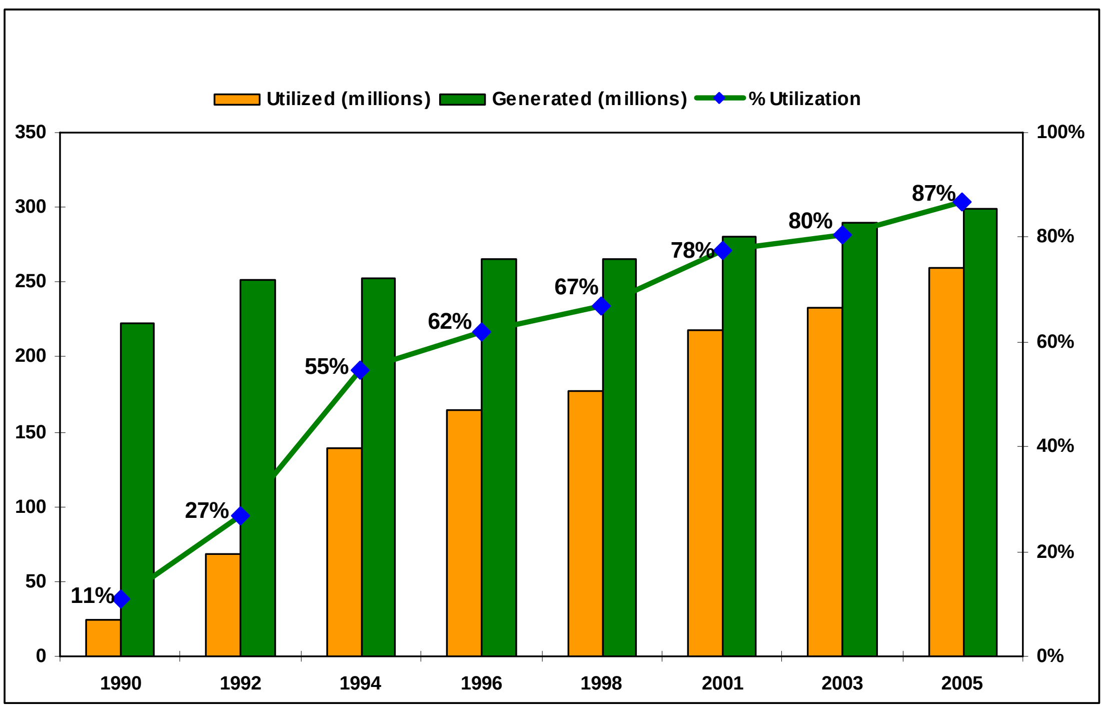

Figure 48: U.S. Scrap Tire Management Trends, 1990 - 2005 (in millions of tires).

NOTE: 2007 Data are not reflected on this page due to the shift to reporting scrap tire data in terms of weight from units or millions of tires. The data presented here reflect scrap tire trends in millions of tires in 1990 – 2005. Scrap tire data by weight for 2005 and 2007 are presented in Table 3 on page 17 and discussed in the body of this report.

APPENDIX B: U.S. Scrap Tire Markets 2007 Data (in Thousands of Tons)

State Name	EPA Region	Tire Derived Fuel as reported	Tire Derived Fuel RMA Adjusted	Ground Rubber	Civil Engineering	Exported	Electric Arc Furnace	Agricultural	Punched Stamped	Reclamation Projects	Total To Mkt[1] as Reported	Total To Mkt[1] RMA Adjusted	Baled[2]	Land Disposed[3]	Annual Generation	% in Markets as Reported	% in Markets RMA Adjust
Alabama	Region IV	68.2	74.4	UNK	0.4	UNK	15.4	UNK	1.1	UNK	85.0	91.3	0.0	37.0	83.3	102.1%	109.6%
Alaska	Region X	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.6	12.6	0.0%	0.0%
Arizona	Region IX	0.0	0.0	101.8	0.0	13.1	0.0	UNK	UNK	0.0	114.9	114.9	0.0	0.0	117.3	97.9%	97.9%
Arkansas	Region VI	40.0	44.3	3.3	1.7	0.0	0.0	0.0	0.0	8.0	52.9	57.2	0.0	15.6	52.2	101.4%	109.5%
California	Region IX	77.2	77.2	92.1	63.5	52.4	0.0	1.0	UNK	UNK	286.2	286.2	UNK	114.5	444.0	64.5%	64.5%
Colorado	Region VIII	33.32	33.3	9.94	17.79	UNK	UNK	0.33	UNK	0.0	61.4	61.4	0.0	14.8	83.93	73.1%	73.1%
Connecticut	Region I	185.0	185.0	UNK	UNK	UNK	UNK	UNK	UNK	UNK	185.0	185.0	UNK	0.0	64.8	285.7%	285.7%
Delaware	Region III	UNK	0.0	UNK	9.3	UNK	UNK	UNK	UNK	UNK	9.3	9.3	0.0	3.7	13.9	66.6%	66.6%
Florida	Region IV	124.7	124.7	47.3	12.5	2.5	0.0	UNK	UNK	UNK	187.0	187.0	UNK	20.5	205.0	91.2%	91.2%
Georgia	Region IV	236.8	287.4	25.0	UNK	UNK	0.0	UNK	0.0	UNK	261.8	312.4	0.0	0.0	222.0	117.9%	140.7%
Hawaii	Region IX	5.0	6.3	0.0	0.0	UNK	0.0	0.0	0.0	0.0	5.0	6.3	0.0	1.6	10.0	50.0%	62.5%
Idaho	Region X	8.3	8.3	0.0	UNK	UNK	0.0	UNK	UNK	0.0	8.3	8.3	UNK	9.3	27.1	30.7%	30.7%
Illinois	Region V	45.6	49.3	UNK	0.0	UNK	0.0	UNK	UNK	0.0	45.6	49.3	0.0	0.0	175.0	26.0%	28.2%
Indiana	Region V	0.2	0.2	UNK	1.9	UNK	UNK	UNK	UNK	UNK	2.1	2.1	UNK	0.0	149.4	1.4%	1.4%
Iowa	Region VII	0.0	0.0	18.5	2.0	UNK	0.0	UNK	UNK	0.0	20.5	20.5	UNK	0.0	53.7	38.2%	38.2%
Kansas	Region VII	4.9	4.9	UNK	UNK	UNK	0.0	UNK	0.5	UNK	5.4	5.4	UNK	0.0	52.6	10.3%	10.3%
Kentucky	Region IV	33.8	42.2	18.5	11.3	0.0	0.0	0.0	0.0	0.0	63.5	71.9	0.0	0.0	77.7	81.7%	92.6%
Louisiana	Region VI	259.0	259.0	18.5	UNK	UNK	0.0	UNK	UNK	UNK	277.5	277.5	UNK	9.3	79.4	349.4%	349.4%
Maine	Region I	85.0	85.0	0.0	3.0	UNK	0.0	UNK	UNK	0.0	88.0	88.0	0.0	0.0	15.0	586.7%	586.7%
Maryland	Region III	55.0	55.0	18.5	34.8	UNK	0.0	UNK	UNK	0.0	108.2	108.2	0.0	0.0	103.6	104.5%	104.5%
Massachusetts	Region I	0.0	0.0	UNK	0.0	UNK	0.0	UNK	UNK	0.0	0.0	0.0	0.0	0.0	120.3	0.0%	0.0%
Michigan	Region V	120.0	145.0	23.9	11.2	UNK	UNK	UNK	UNK	UNK	155.1	180.0	UNK	0.0	100.0	155.1%	180.0%
Minnesota	Region V	9.3	9.3	18.5	92.5	UNK	0.0	UNK	UNK	UNK	120.3	120.3	0.0	0.0	95.9	125.4%	125.4%
Mississippi	Region IV	91.6	114.5	18.3	0.0	0.0	0.1	UNK	0.0	0.0	110.0	132.9	0.0	11.4	51.6	213.3%	257.7%
Missouri	Region VII	32.0	38.1	UNK	UNK	UNK	UNK	UNK	UNK	UNK	32.0	38.1	UNK	5.5	101.8	31.4%	37.4%
Montana	Region VIII	0.0	0.0	0.0	0.0	UNK	0.0	UNK	UNK	0.0	0.0	0.0	9.3	5.6	17.7	0.0%	0.0%
Nebraska	Region VII	9.7	9.7	4.0	13.8	0.0	0.0	0.0	0.0	0.6	28.0	28.0	0.0	6.3	37.3	75.1%	75.1%
Nevada	Region IX	0.0	0.0	UNK	UNK	UNK	UNK	UNK	UNK	UNK	0.0	0.0	UNK	18.5	18.5	0.0%	0.0%
New Hampshire	Region I	18.5	18.5	UNK	UNK	UNK	UNK	UNK	UNK	0.0	18.5	18.5	UNK	0.0	24.1	76.9%	76.9%
New Jersey	Region II	UNK	0.0	27.8	UNK	UNK	0.0	UNK	UNK	UNK	27.8	27.8	0.0	0.0	155.4	17.9%	17.9%
New Mexico	Region VI	5.1	5.1	0.8	4.8	UNK	0.0	UNK	UNK	7.6	18.4	18.4	0.0	3.4	35.2	52.2%	52.2%
New York	Region II	37.9	47.4	39.8	44.6	UNK	1.7	UNK	UNK	UNK	124.0	133.5	0.0	0.0	200.0	62.0%	66.7%
North Carolina	Region IV	76.9	96.2	6.5	26.4	UNK	0.0	UNK	UNK	0.0	109.8	129.0	0.0	61.0	199.8	55.0%	64.6%
North Dakota	Region VIII	1.0	1.3	UNK	1.8	UNK	0.0	1.0	UNK	UNK	3.8	4.0	0.0	4.5	11.8	32.0%	34.1%
Ohio	Region V	19.9	24.6	15.3	76.6	UNK	UNK	UNK	0.0	0.0	111.8	116.5	0.0	19.7	146.4	76.4%	79.5%
Oklahoma	Region VI	34.6	34.6	28.8	3.4	UNK	0.0	UNK	UNK	UNK	66.8	66.8	0.0	0.2	66.8	100.0%	100.0%
Oregon	Region X	11.0	11.0	UNK	UNK	21.0	UNK	UNK	UNK	UNK	32.0	32.0	UNK	36.72	69.1	46.3%	46.3%
Pennsylvania	Region III	170.3	170.3	125.0	UNK	0.0	0.0	0.0	0.0	0.0	295.3	295.3	0.0	0.0	203.5	145.1%	145.1%
Rhode Island	Region I	18.5	18.5	0.0	0.0	UNK	0.0	UNK	UNK	UNK	18.5	18.5	0.0	0.0	18.5	100.0%	100.0%
South Carolina	Region IV	101.0	122.4	5.3	28.0	UNK	0.0	UNK	UNK	UNK	134.3	155.7	0.0	0.0	86.0	156.2%	181.1%
South Dakota	Region VIII	10.3	12.9	UNK	UNK	UNK	UNK	UNK	UNK	UNK	10.3	12.9	UNK	0.0	7.0	147.1%	183.9%
Tennessee	Region IV	50.0	59.4	UNK	UNK	UNK	10.0	UNK	UNK	0.0	60.0	69.4	0.0	0.0	109.2	55.0%	63.6%
Texas	Region VI	105.7	105.7	29.6	12.1	0.0	0.0	4.82	0.2	116.4	268.7	268.7	0.0	55.9	250.0	107.5%	107.5%
Utah	Region VIII	22.6	22.6	11.0	8.6	UNK	0.0	0.0	0.0	0.0	42.1	42.1	0.0	0.0	42.2	99.9%	99.9%
Vermont	Region I	8.9	8.9	0.1	0.1	0.0	UNK	0.0	UNK	0.0	9.1	9.1	0.0	0.0	11.1	81.9%	81.9%
Virginia	Region III	26.7	31.6	7.0	70.1	UNK	0.0	UNK	UNK	0.0	103.8	108.6	0.0	0.2	142.5	72.8%	76.3%
Washington	Region X	16.7	16.7	27.9	9.7	13.1	UNK	UNK	UNK	UNK	67.4	67.4	0.0	33.7	85.4	78.9%	78.9%
West Virginia	Region III	10.0	12.5	UNK	UNK	UNK	0.0	UNK	UNK	UNK	10.0	12.5	UNK	92.5	33.5	29.9%	37.3%
Wisconsin	Region V	11.5	11.5	46.3	0.0	UNK	0.0	UNK	UNK	0.0	57.8	57.8	0.0	0.0	103.6	55.8%	55.8%
Wyoming	Region VIII	UNK	0.0	UNK	UNK	0.0	0.0	UNK	0.0	UNK	0.0	0.0	0.0	0.0	9.5	0.0%	0.0%
TOTALS		2281.5	2484.4	789.1	561.6	102.1	27.1	7.1	1.9	132.6	3902.9	4105.8	9.3	594.0	4595.7	84.9%	89.3%

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" represents tires that were baled but not consumed in markets. The data in this column are not included in the market totals. Several states reported tire bales used in civil engineering market applications. Data documenting volumes consumed by these markets are included in the civil engineering market data.

[3]"Land disposed" includes tires that were landfilled or monofilled.

[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: U.S. Tire-Derived Fuel Users 2007

State	Location	Company	Type of Facility
Alabama	Calera	Lafarge North America	Cement kiln
Alabama	Courtland	International Paper Corp.	Pulp & paper mill
Alabama	Theodore	Holcim Inc.	Cement kiln
Alabama	Leeds	Lehigh Cement Company	Cement Kiln
Alabama	Ragland	National Cement	Cement kiln
Alabama	Stevenson	Smurfit-Stone	Pulp & paper mill
Alabama	Demopolis	CEMEX	Cement kiln
Arkansas	Foreman	Ash Grove Cement Company	Cement kiln
Arkansas	Crossett	Georgia Pacific	Pulp & paper mill
Arkansas	Ashdown	Domtar, Inc.	Pulp & paper mill
Arkansas	Pine Bluff	International Paper	Pulp & paper mill
California	Colton	California Portland Cement	Cement kiln
California	Victorville	CEMEX	Cement kiln
California	Redding	Lehigh Southwest	Cement kiln
California	Stockton	Stockton Co-generation	Industrial boiler
California	Lucerne Valley	Mitsubishi Cement	Cement kiln
California	Lebec	National Cement Co. of CA	Cement kiln
California	Kern County	Mt. Posco Cogeneration	Industrial boiler
Colorado	Florence	Holcim, Inc.	Cement kiln
Connecticut	Sterling	Exeter Energy	Dedicated tire-to-energy
Florida	Auburndale	Wheelabrator Ridge Generating Station	Utility boiler
Florida	Brooksville	CEMEX	Cement kiln
Florida	Brooksville	Rinker Materials	Cement kiln
Florida	Gainesville	Florida Rock	Cement kiln
Florida	Across the state	Names not supplied	Waste-to-energy (8)
Florida		Confidential	Pulp & paper mill
Georgia	Clinchfield	CEMEX	Cement kiln
Georgia	Brunswick	Georgia Pacific	Pulp & paper mill
Georgia	Rome	Temple Inland-Rome	Pulp & paper mill
Georgia	Riceborough	Interstate Paper	Pulp & paper mill
Georgia	Dublin	SP Newsprint	Pulp & paper mill
Georgia	Cedar Springs	Georgia Pacific	Pulp & paper mill
Hawaii	Oahu	AES Hawaii, Inc.	Industrial boiler
Idaho	Inkom	Ash Grove Cement Company	Cement kiln
Idaho	Boise	Boise P&N LLC (Boise Cascade)	Pulp & paper mill
Illinois	Decatur	Archer Daniels Midland (ADM)	Industrial boiler
Illinois	Oglesby	Buzzi Unichem USA	Cement kiln
Illinois	Grand Chain/Joppa	Lafarge North America	Cement kiln
Kansas	Humboldt	Monarch Cement	Cement kiln
Kansas	Chanute	Ash Grove Cement Company	Cement kiln
Kentucky	Owensboro	Owensboro Municipal Utilities	Utility boiler
Kentucky	Wickliffe	NewPage Corporation	Pulp & paper mill
Louisiana	Mansfield	International Paper	Pulp & paper mill
Louisiana	Bastrop	International Paper	Pulp & paper mill
Louisiana	Monroe	International Paper	Pulp & paper mill
Louisiana	Deridder	Boise	Pulp & paper mill
Maryland	Fredrick	Fort Detrick	Industrial boiler
Maryland	Baltimore	Wheelabrator Baltimore LP	Utility boiler
Maryland	Joppa	Harford Waste-to-Energy	Utility boiler
Maine	Rumford	NewPage Corporation	Pulp & paper mill
Maine	Bucksport	International Paper	Pulp & paper mill
Maine	Skowhegan	SD Warren	Pulp & paper mill
Michigan	Hillman	Hillman Power	Utility boiler
Michigan	McBain	Viking Energy	Utility boiler
Michigan	Lincoln	Viking Energy	Utility boiler
Michigan	Dundee	Holcim, Inc.	Cement kiln
Michigan	Wyandotte	Wyandotte Power	Utility boiler
Michigan	Filer City	Tondu Energy	Utility boiler
Michigan	Grayling	Grayling Generating Station	Industrial boiler

APPENDIX C: U.S. Tire-Derived Fuel Users 2007, continued.

State	Location	Company	Type of Facility
Michigan	Escanaba	New Page	Pulp & paper mill
Michigan	Quinasec	Mananany Paper	Pulp & paper mill
Minnesota	Satell	Versa Paper	Pulp & paper mill
Mississippi	Montecello	Georgia Pacific	Pulp & paper mill
Mississippi	Jackson	Nucor Steel	Electric arc furnace
Mississippi	Vicksburg	(International Paper)	Pulp & paper mill
Missouri	Columbia	University of Missouri-Columbia	Industrial boiler
Missouri	Kansas City	Aquila/ Sibley Generating Station	Utility boiler
Missouri	Cape Girardeau	Buzzi Unichem USA	Cement kiln
Missouri	Joplin	Empire District Electric Co. Asbury Power Plant	Utility boiler
Missouri	St. Joseph	Aquila, Inc. -	Utility boiler
Nebraska	Lincoln	Ashgrove	Cement kiln
New York	Auburn	Nucor Steel Auburn	Electric arc furnace
New York	Fort Drum	Black River Electric	Utility boiler
New York	Niagara Falls	Niagara Generation	Industrial boiler
North Carolina	Roxboro	Primary Energy	Industrial boiler
North Carolina	Southport	Primary Energy	Industrial boiler
North Carolina	Lumberton	Cogentrix	Industrial boiler
North Dakota	Mandan	MDU Heskett Station	Utility boiler
Ohio	Akron	Akron Thermal, LLP	Utility boiler
Ohio	Chillicothe	PH Glatfelter	Pulp & paper mill
Oklahoma	Ada	Holcim, Inc.	Cement kiln
Oklahoma	Tulsa	Lafarge North America	Cement kiln
Oklahoma	Pryor	Lone Star Industries Inc. dba Buzzi Unicem	Cement kiln
Oregon	Durkee	Ash Grove Cement Company	Cement kiln
Pennsylvania	Wampum	Cemex	Cement kiln
Pennsylvania	Whitehall	Lafarge North America	Cement kiln
Pennsylvania	Allentown	Lehigh Cement	Cement kiln
Pennsylvania	Meadville	ESSROC Materials	Cement kiln
Pennsylvania	Northampton	Northampton Generation (2008 start up)	Industrial boiler
South Carolina	Hodges	Trigen Biopower	Industrial boiler
South Carolina	Harleyville	Lafarge North America	Cement kiln
South Carolina	Catawba	Bowater	Pulp & paper mill
South Carolina	Hartsville	Sonoco Products Company	Pulp & paper mill
South Carolina	Eastover	International Paper	Pulp & paper mill
South Carolina	Georgetown	International Paper	Pulp & paper mill
South Dakota		Ottertail Power Company	Utility Boiler
Tennessee	Calhoun	Bowater Incorporated	Pulp & paper mill
Tennessee	Memphis	TVA Allen Steam Plant	Utility boiler
Tennessee	Knoxville	CEMEX	Cement Kiln
Tennessee	Jackson	Gerdau Ameristeel	Electric arc furnace
Texas	Midlothian	Ash Grove Cement, Texas L.P. (f/k/a North Texas Cement)	Cement kiln
Texas	New Braunfels	Cemex of Texas, L.P.	Cement kiln
Texas	Midlothian	Holcim Texas L.P.	Cement kiln
Texas	Mary Neal	Lone Star Cement	Cement kiln
Texas	Hunter	Texas Industries	Cement kiln
Texas	Midlothian	Texas Industries Cement	Cement kiln
Utah	Leamington	Ashgrove	Cement kiln
Utah	Morgan	Holcim Inc.	Cement kiln
Utah	Grantsville	Chemical Lime Company	Lime kiln
Virginia	Richmond	Cogentrix	Industrial boiler
Virginia	Portsmouth	Southeastern Public Service Authority	Industrial boiler
Virginia	Martinsville	Tire Energy Corp (TEC)	Industrial boiler
Washington	Seattle	Ashgrove Cement	Cement kiln
West Virginia	Parkersburg	Allegeny Power	Utility boiler
Wisconsin	Cassville	Alliant Energy	Utility boiler
Wisconsin	Sheboygan	Alliant Energy Edgewater Generating Station	Utility boiler
Wisconsin	Ashland	Xcel Energy Bayfront Plant	Utility boiler
Wisconsin	Madison	University of Wisconsin Charter Street Plant	Industrial boiler
Wisconsin	Kaukauna	Thilmany Paper	Pulp & paper mill

APPENDIX D: U.S. Scrap Tire Stockpiles Historical Data 1990 - 2007 (in millions of scrap tires)

State	EPA Region	1990	1992	1994	1996	2001	2003	2005	2007	% change since 1990	% change since 1994	% of 2007 Stockpiles	2007 Cum.%
Arkansas	Region VI			5.0	3.0	0.0	0.3	0.1	UKN		UNK	UNK	0.0%
Idaho	Region X			1.1	0.3	0.5	DNR	DNR	UKN		UNK	UNK	0.0%
Nevada	Region IX			2.0	1.0	0.2	UKN	DNR	UKN		UNK	UNK	0.0%
Tennessee	Region IV			16.0	UKN	UKN	0.3	0.3	UKN		UNK	UNK	0.0%
Colorado	Region VIII			UKN	UKN	28.0	35.0	40.0	49.9			38.8%	38.8%
New York	Region II			30.0	30.0	40.0	40.0	37.0	14.1		-53.2%	10.9%	49.8%
Texas	Region VI			69.0	84.6	58.0	53.0	24.6	14.0		-79.7%	10.9%	60.7%
Arizona	Region IX			4.8	DNR	0.0	DNR	DNR	10.0		108.3%	7.8%	68.5%
Massachusetts	Region I			10.0	6.0	10.0	10.0	4.0	10.0		0.0%	7.8%	76.3%
Alabama	Region IV			DNR	DNR	25.0	20.0	18.0	6.0		UNK	4.7%	81.0%
North Dakota	Region VIII			UKN	0.6	0.2	DNR	3.6	3.0		UNK	2.3%	83.3%
Delaware	Region III			DNR	2.0	3.5	DNR	2.5	2.4		UNK	1.9%	85.2%
Pennsylvania	Region III			34.0	21.0	13.0	12.0	7.9	1.7		-94.9%	1.3%	86.5%
Maryland	Region III			15.0	12.0	DNR	1.7	1.6	1.4		-90.6%	1.1%	87.6%
New Mexico	Region VI			1.0	1.4	0.2	0.7	0.0	1.3		31.0%	1.0%	88.6%
Nebraska	Region VII			2.0	1.6	1.2	2.0	1.3	0.9		-57.5%	0.7%	89.3%
Washington	Region X			18.0	18.0	0.3	3.2	2.5	0.7		-95.9%	0.6%	89.9%
Hawaii	Region IX			0.2	0.2	2.0	1.3	0.4	0.4		160.0%	0.3%	90.2%
Oklahoma	Region VI			15.0	1.9	0.6	0.7	0.7	0.4		-97.4%	0.3%	90.5%
Missouri	Region VII			10.0	4.7	3.6	4.0	1.3	0.3		-97.0%	0.2%	90.7%
Georgia	Region IV			8.0	2.0	0.3	0.3	0.0	0.2		-97.3%	0.2%	90.9%
Vermont	Region I			1.0	UKN	0.2	DNR	0.1	0.2		-80.0%	0.2%	91.0%
North Carolina	Region IV			8.3	1.0	0.1	0.1	0.1	0.2		-98.0%	0.1%	91.2%
California	Region IX			42.0	42.0	2.0	2.0	1.5	0.1		-99.7%	0.1%	91.3%
Mississippi	Region IV			0.7	1.0	0.0	0.0	0.0	0.1		-88.6%	0.1%	91.3%
Utah	Region VIII			5.6	0.5	0.3	0.1	0.1	0.1		-98.6%	0.1%	91.4%
Connecticut	Region I			6.0	6.0	20.0	20.0	20.0	0.0		-99.8%	0.0%	91.4%
Alaska	Region X			DNR	DNR	0.0	DNR	DNR	0.0		UNK	0.0%	91.4%
Illinois	Region V			20.0	4.0	1.8	0.0	0.2	0.0		-100.0%	0.0%	91.4%
Indiana	Region V			20.0	15.0	1.5	5.5	1.7	0.0		-100.0%	0.0%	91.4%
Iowa	Region VII			6.4	7.3	1.8	1.0	0.1	0.0		-100.0%	0.0%	91.4%
Kansas	Region VII			UKN	2.5	0.1	0.2	DNR	0.0		UNK	0.0%	91.4%
Kentucky	Region IV			10.0	8.0	0.5	0.1	DNR	0.0		-100.0%	0.0%	91.4%
Louisiana	Region VI			40.0	6.2	0.0	0.1	DNR	0.0		-100.0%	0.0%	91.4%
Maine	Region I			60.0	60.0	1.0	1.0	0.2	0.0		-100.0%	0.0%	91.4%
Michigan	Region V			20.0	25.0	25.0	25.0	10.6	6.5		-67.4%	5.1%	96.5%
Minnesota	Region V			0.8	0.1	0.0	0.0	DNR	0.0		-100.0%	0.0%	96.5%
Montana	Region VIII			UKN	0.5	0.0	1.0	0.5	0.0		UNK	0.0%	96.5%
New Hampshire	Region I			DNR	1.1	0.8	DNR	0.0	0.0		UNK	0.0%	96.5%
New Jersey	Region II			5.5	5.0	7.0	8.0	1.3	0.0		-100.0%	0.0%	96.5%
Ohio	Region V			100.0	100.0	40.0	20.0	3.6	1.8		-98.2%	1.4%	97.9%
Oregon	Region X			3.0	6.0	0.1	0.0	DNR	0.0		-100.0%	0.0%	97.9%
Rhode Island	Region I			34.0	33.0	DNR	DNR	0.0	0.0		-100.0%	0.0%	97.9%
South Carolina	Region IV			UKN	5.7	0.1	0.0	0.0	0.0		UNK	0.0%	97.9%
South Dakota	Region VIII			2.0	2.0	0.1	0.0	0.0	0.0		-100.0%	0.0%	97.9%
Virginia	Region III			14.5	14.0	7.5	3.2	2.2	2.7		UNK	2.1%	100.0%
West Virginia	Region III			6.8	6.8	12.0	0.0	DNR	0.0		-100.0%	0.0%	100.0%
Wisconsin	Region V			4.0	1.0	0.0	DNR	0.6	0.0		-100.0%	0.0%	100.0%
Wyoming	Region VIII			0.3	UKN	0.0	DNR	DNR	0.0		-100.0%	0.0%	100.0%
Florida	Region IV			7.1	5.0	DNR	0.1	0.1	0.0		-99.4%	0.0%	100.0%
TOTALS		1000	1000	658.9	548.9	308.4	271.8	188.4	128.4	-87.2%	-80.5%		

APPENDIX E: State Scrap Tire Programs Summary

State Name	EPA Region	Fee Collected	Funds Removed	Fee Collected By	Fee Sunset Date	FeeAccount	Prohibit Collection Of Other Fees?	Hauler Permit Required?	Storage Disposal Reg Or Permit Required?	Whole Tires Allowed InLandfill?	Cut,Shredded Tires Allowed In Landfill?	Monofills Allowed?	Stockpile Cleanup Program Exist?	Active Clean Up Program?	Financial Assurance For Processor?	Financial Assurance For Haulers?	Subsidies Grants Loans	Grant Budget	GrantAvg Award	Grant Eligibility	Additional Comments
Alaska	Region X	$2.50	Y	Point of purchase		The entire amount of money raised from the tire fee is sent to the general fund. No scrap tire programs exist or are funded.	N	N	N	Y	Y	N	N	N	N	N					
Alabama	Region IV	$1.00	N	Retail point of sale		One dollar per tire for each new, used, retread tire sold retail. Fund allocated as follows: 45-75% site remediation, 0-20% regulatory program, 0-20% market development, 5% state revenue department allocation for cost of collection disbursement, 5% returned to retailer for cost of collection submittal to state revenue department, 0-10% county delegation.	N	Y	Y	Y	Y	Y	Y	Y	Y	Y				Market Development is currently assigned to different state agency (Dept. of Economic and Community Affairs) by statute. This agency has not yet developed a market development program nor given grants associated with tire program funds.	
Arkansas	Region VI	$2.00	UNK	at point of retail sales of new replacement tires		$2 is collected on all auto, light truck, and big truck tires with an additional $3 fee collected on big truck tires. The $2 fees are distributed out to the Regional SW districts using a comprehensive formula that is half population based and half based on a percentage of the overall auto and truck tires managed during the prior calendar year. (10% is put aside for abatement and special grants) The $3 fee is disbursed based upon a percentage of the overall truck tires managed during the prior calendar year.	Y	Y	Y	N	Y	Y	Y	N	Y	N	Local Governments	6,425,000	91,000	Numerous requirements including but not limited to: being a regional solid waste management district, having an approved tire plan on file with ADEQ, applying for funding biennially for an approved use of the funds, following county purchase procedures and public noticing app and bidding out services, district and/or contractors having required licenses and permits.	
Arizona	Region IX	$2.00	N	Point of sale		To counties to cover the cost of tire disposal	N	Y	Y	N	Y	N	N		UNK	UNK					
California	Region IX	$1.75	Y	Board of Equalization (BOE)	1/1/2015	Sellers of new tires collect fee from their customers for each new tire they sell. The retailer pays the fee to the BOE, who deposits $1.00 of the fee in California Tire Recycling Management Fund and $0.75 of the fee in Air Pollution Control Fund. CIWMB distributes funds for activities related to tire enforcement, remediation, research, market development, and a hauler manifest system. The Air Resource Board uses their portion of the fee to fund the Carl Moyer Program.	N	Y	Y	N	Y	Y	Y	Y	N	Y	Processors, Local Governments, School Districts	20,000,000	50,000	Vary by grant programs.	
Colorado	Region VIII	$1.25	N	retail fee for disposal of old tires	7/1/2010	When tires are replaced, the disposition fee for used tires is $1.25 per tire which is with a distribution of 25% for tire reuse/ recyclers, 25% for processors/ end users, 50% to the Recycling Resource Economic Opportunity Fund.	UNK	Y	Y	N	N	Y	Y	Y	UNK	N	Processors				
Connecticut	Region I		N				N	N	Y	N	N	N	N		Y	N					
Delaware	Region III	$2.00	N	Department of Revenue	12/31/2008	A $2.00 fee on each new tire sold	N	N	Y	N	Y	N	Y	Y	Y	N					Financial Assurance for Scrap Tire Processers in Delaware determined by the number of scrap tires stored at the facility.
Florida	Region IV	$1.00	Y	retail		1% allocated to Dept. of Revenue for collecting fee; $2 million allocated to Dept. of Agriculture for mosquito control and small tire pile (under 1500) cleanup; and remainder to Dept. of Environmental Protection for waste tire and solid waste management programs, including enforcement.	N	Y	Y	N	Y	N	Y	Y	Y	N					
Georgia	Region IV	$1.00	Y	Primarily retailers but also some wholesalers.	6/30/2008	A tire management fee is imposed upon the retail sale of all new replacement tires in the state of $1.00 per tire sold. The fee is not imposed on the sale of tires with a rim size less than 12", tires from any device moved exclusively by human power, or tires used exclusively for agricultural purposes, except farm truck tires. Fees collected are initially deposited into the general treasury and must be appropriated to the Solid Waste Trust Fund (SWTF). Funds appropriated are then available to fund the multiple purposes of the SWTF, including the management and cleanup of scrap tires.	N	Y	Y	N	N	N	Y	Y	Y	Y	Local Governments				Financial assurance required for scrap tire carriers is in the amount of $5,000 if the carrier transports up to 500 scrap tires per month and $10,000 if the scrap tire carrier transports more than 500 scrap tires per month. Very few scrap tire carriers in Georgia qualify to maintain financial assurance at the $5,000 level.
Hawaii	Region IX	$3.00	N	disposal fee		assessed upon purchase of new tires, and retained by retailers to pay for tire transport and processing	N	N	Y	N	Y	N	N		N	N					

APPENDIX E: State Scrap Tire Programs Summary, cont'd.

State Name	EPA Region	Fee Collected	Funds Removed	Fee Collected By	Fee Sunset Date	FeeAccount	Prohibit Collection Of Other Fees?	Hauler Permit Required?	Storage Disposal Reg Or Permit Required?	Whole Tires Allowed InLandfill?	Cut,Shredded Tires Allowed In Landfill?	Monofills Allowed?	Stockpile Cleanup Program Exist?	Active Clean Up Program?	Financial Assurance For Processor?	Financial Assurance For Haulers?	Subsidies Grants Loans	Grant Budget	GrantAvg Award	Grant Eligibility	Additional Comments
Iowa	Region VII	$1.00	UNK	Point of purchase		UNK	N	Y	Y	N	Y	UNK	Y	UNK	Y	Y	End Users				
Idaho	Region X		UNK				N	UNK	Y	Y	Y	N	N		Y	N					
Illinois	Region V	$2.00	Y	Point of retail sale		The total fee collected is $2.50/tire. $.50 goes to the Emergency Public Health Fund to help units of local government with their mosquito control efforts. Of the remaining $2.00, $1.80 goes into the Used Tire Management Fund, which goes to IEPA and IDP (public health). The funds that aren't allocated to IEPA and IDPH, which is a majority of the funds collected, goes into our General Revenue Fund.	N	Y	Y	N	N	N	Y	Y	Y	N					
Indiana	Region V	$0.25	UNK	Point of purchase		UNK	N	UNK	Y	N	Y	UNK	UNK		UNK	UNK	Processors, End Users, Local Governments				
Kansas	Region VII	$0.25	Y	New tire dealer		This fund is used for program management, personnel, emergency pile cleanup, and grants.	N	Y	Y	N	Y	Y	N		Y	Y	Processors, End Users, Local Governments	500,000	10,400	The last round was for playgrounds owned by public entities including schools, local governments and state parks. 39 playgrounds were awarded money. Previous rounds have been for equipment that all has gone to private entities for processing equipment.	
Kentucky	Region IV	$1.00	Y	At the new tire retailer level	7/31/2010	The fee is assessed on every new "Motor Vehicle", as defined by statute, sold. Retailers collect the fee and are allowed to keep 5% for administrative purposes. Fee is remitted monthly to the state Revenue Cabinet on forms provided. Fee is deposited into designated Waste Tire Trust Fund. The Revenue Cabinet is reimbursed up to $50,000/yr to cover costs of assessing and collecting fee and is vested with assement and collection powers. Remaining balace is designated for use by the Division of Waste Management to implement the waste tire management program including tire dump abatement. Current annual fees average $2.8 million/yr after retailer percentage and Revenue Cabinet cost.	N	Y	Y	N	Y	N	Y	Y	Y	Y	Local Governments			There is no set bugdet for the grants. Amount is determined annually based upon estimated costs to complete clean-ups and run drop off program. In 2007, 50 grants were awarded at an average of $24,000 each.	
Louisiana	Region VI	$1.00	Y	point of purchase		Funds are used for reimbursement to processors upon sale of the tire-derived products	Y	Y	Y	N	Y	Y	N		UNK	UNK					
Massachusetts	Region I		N				N	N	Y	N	N	N	N		N	N					
Maryland	Region III	$0.80	Y	first sale of new tire in MD		Fees go into Used Tire Cleanup & Recycling Fund. Fund is used for administration of program, including licensing, enforcement, inspections. Fund is also used for cleanups (cost recovery is pursued for most cleanups) and projects to promote the use of recycled tire products.	N	Y	Y	N	N	N	Y	Y	Y	N	Processors		3,000,000	Only one grant has been awarded. Extensive application requirements are specified in scrap tire statute.	
Maine	Region I	$1.00	N	Point of purchase		stockpile abatement	N	Y	Y	N	N	N	Y	Y	UNK	UNK	End Users				
Michigan	Region V	$1.50	N	Secretary of State's Office	12/31/2012	The $1.50 fee is collected on vehicle title certifcate transfers by the Secretary of State's Office. Funds are used for stockpile abatement programs and grants.	N	Y	Y	N	Y	N	Y	Y	Y	N	Processors, End Users, Local Governments	3,900,000	82,000	Criteria is available on our web page at the following link: http://www.michigan.gov/deq/0,1607,7-135-3312_4122-176203--,00.html	
Minnesota	Region V		N				N	Y	Y	N	N	N	N		Y	N					
Missouri	Region VII	$0.50	Y	Sales at retail	1/1/2010	Funds used for abatement programs and grants for tire-derived products	N	Y	N	N	Y	N	Y	Y	Y	N	End Users	10,000	10,000	Playground surfacing material	

APPENDIX D: State Scrap Tire Programs Summary,cont'd.

State Name	EPA Region	Fee Collected	Funds Removed	Fee Collected By	Fee Sunset Date	FeeAccount	Prohibit Collection Of Other Fees?	Hauler Permit Required?	Storage Disposal Reg Or Permit Required?	Whole Tires Allowed InLandfill?	Cut,Shredded Tires Allowed In Landfill?	Monofills Allowed?	Stockpile Cleanup Program Exist?	Active Clean Up Program?	Financial Assurance For Processor?	Financial Assurance For Haulers?	Subsidies Grants Loans	Grant Budget	GrantAvg Award	Grant Eligibility	Additional Comments
Mississippi	Region IV	$1.00	Y	Wholesaler		60% Grants to counties, municipalities or regional solid waste management authorities for operation of small quantity generator collection sites, for clean-up of tire dumps, for employment of enforcement officers, and for purchase of products derived from Mississippi waste tires -15% Waste tire recycling and incentive grants -5% Waste tire abatement program -20% Waste tire administrative	N	Y	Y	N	Y	Y	Y	Y	Y	N	Processors, End Users, Local Governments			Grant awards to processors and end users are generally awarded through the Recycling and Incentive Grants Program. This program receives 15% of the funds collected by the waste tire fee collected at wholesale. Commercial and private entities applying for such grant funds must provide a 50% match for the amount of grant being applied for. Further, 75% of the tires to be accepted by the applicant must originate in Mississippi. Grants for local governments generally are for the operation of local government waste tire collection programs. 60% of the funds collected by the state support this grant program. State law requires that every county provide such a program to assist small quantity generators of waste tires such as residents and small businesses with the proper management and disposal of waste tires. These grants assist local governments in maintaining, operating and advertising these programs.	
Montana	Region VIII		N				N	Y	UNK	Y	Y	Y	N		UNK	UNK					
North Carolina	Region IV	$0.00	Y	Point of sale of new tires		Our fee is a percent of the purchase price of the new tire. If the tire is less than 20 inches, the fee is 2% of the price. If the tire is 20 inches or larger, the fee is 1% of the price.	N	Y	Y	N	Y	Y	Y	Y	Y	N	Processors, End Users, Local Governments	4,000,000	600,000	Need, sustainability, technical feasibility, financial feasibility, company viability, managerial and technical expertise, tonnage affected, grant allocation per tire recycled, impact on NC scrap tires, job created, capital investment, transferability.	
North Dakota	Region VIII		N				N	Y	Y	Y	Y	Y	N		N	N					
Nebraska	Region VII	$1.00	UNK	At the retailer		Fee is on each new tire purchased in the State. Goes to waste reductin and recycling incentive fund: 1st million is set aside for scrap tire projects.	N	Y	N	N	N	N	Y	Y	N	Y		1,000,000	27,800	Refer to NE Revised Statute 81-15,160	
New Hampshire	Region I		N			TOWNS MAY CHARGE FOR TIRE DISPOSAL	N	N	Y	N	Y	N	Y	Y	N	N					
New Jersey	Region II	$1.50	Y	retail sale		$1.50 per tire on the sale of new tires. Funds collected are to be used by the NJDOT for snow removal by the NJDEP for scrap tire stockpile cleanup.	N	N	Y	Y	Y	Y	UNK		N	N	Local Governments			As noted above, funds have been diverted from this program to the General Treasury, but when the program was funded the grants went to county and municipal government.	
New Mexico	Region VI	$0.50	Y	annual Vehicle registrations		A $0.50 of a vehicle's registration fee goes into the Recycling and Illegal Dumping Fund. 2/3 of that fund is used for tire grants. Municipalities, Counties, Cooperative Associantions, Pueblos, Tribes, Indian Nations and Land Grant Associations are eligible for the fund. Grants can be used for abatement of illegal tire dump sites and stockpiles, purchase of tire derived products, purchase of equipment, construction of projects, etc.	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Local Governments	600,000	400,000	#1 priority = cleaning up illegal dumps and stockpiles; supporting sustainable programs is another. At the present tire, the tire grant review committee is working on a ranking system and setting priorities.	
Nevada	Region IX		N				N	Y	N	Y	Y	Y	N		Y	N					The financial assurance requirement is dependent on the number of tires the processor is permitted to have on site.
New York	Region II	$2.50	UNK	At retail sale of tires	12/31/2010	$2.50 fee is placed upon the purchase of a new tire. This is also applicable to the 5 tires on a new car and to tires on all vehicles that are or could be registered for over the road use. Fees collected are sent to a dedicated fund. Of the $2.50, the tire dealer gets to keep $0.25 as a processing fee. The remaining $2.25 goes to a dedicated state fund. Use of funds collected from the fee are subject to legislative appropriation to NYSDEC, Empire State Development, NYSDOH, NYSDOT, NYSERDA and Thruway Authority.	Y	Y	Y	N	N	N	Y	Y	Y	N	Processors			Budget is subject to annual allocation - it has been in the $3 to $ 4 million range. To state an average size award would not fairly characterize the program.	As described throughout the various sections of this survey, there are two primary agencies involved in tire recycling in New York State. The Dept. of Environmental Conservation has regulatory responsibility, including abatement of stockpiles and Empire State Development works on scrap tire market development. In 2007 the Dept. of Environmental Conservation and Empire State Development jointly received an Environmental Quality Award from U.S. EPA Region 2 in recognition of both agencies' achievements in reducing its stockpiles and improving tire recycling market conditions. For more information go to http://yosemite.epa.gov/opa/admpress.nsf/cafbeb b41895f4a9852572a000657b5c/66e3e5f260e9ac a9852572c9005eef8a!OpenDocument.

APPENDIX E: State Scrap Tire Programs Summary, cont'd.

State Name	EPA Region	Fee Collected	Funds Removed	Fee Collected By	Fee Sunset Date	FeeAccount	Prohibit Collection Of Other Fees?	Hauler Permit Required?	Storage Disposal Reg Or Permit Required?	Whole Tires Allowed InLandfill?	Cut,Shredded Tires Allowed In Landfill?	Monofills Allowed?	Stockpile Cleanup Program Exist?	Active Clean Up Program?	Financial Assurance For Processor?	Financial Assurance For Haulers?	Subsidies Grants Loans	Grant Budget	GrantAvg Award	Grant Eligibility	Additional Comments
Ohio	Region V	$1.00	N	At the wholesale dealer.	6/30/2011	$750,000 for administration and enforcement. $1,000,000 for scrap tire business grants through the Ohio Department of Natural Resources. The rest of the approximately $7,000,000 generated by the fee per year goes for scrap tire cleanup program.	N	Y	Y	N	N	Y	Y	Y	Y	Y	Processors, End Users, Local Governments	1,000,000	200,000	(1) Burning of scrap tires/tire-derived fuel in Ohio EPA-approved facilities (2) Beneficial use of scrap tires in civil engineering and other applications (3) Recycling of scrap tires into high-value new finished products ODNR web site for scrap tire grants is: http://www.dnr.state.oh.us/Home/Grants/2008ScrapTireGrant/tabid/19436/Default.asp	Tires that can not be processed at a scrap tire recovery facility may be disposed in a landfill or a scrap tire monofill.
Oklahoma	Region VI	$3.50	N	Tire Dealer/Tag Agent		$1.00-rim diameter of 17.5 in. or less $2.50-rim diameter of greater than 17.5 in but less than or equal to 19.5 in. $3.50-rim diameter of greater than 19.5 in. Funds used for reimburement of collection and processing tires. Funds also used to subsidies end users of tire-derived products. Tag Agents assess a fee when a motor vehicle is first registered in the state of Oklahoma.	Y	N	Y	Y	Y	N	Y	Y	Y	N					
Oregon	Region X		UNK				UNK	Y	Y	N	Y	Y	N		Y	Y					
Pennsylvania	Region III	$2.00	Y	At the tire dealers		2 dollars per tire is collected. The fee is used for mass transit.	N	Y	N	N	Y	N	Y	Y	Y	N					Some of questions should allow the answer entered to be zero.
Rhode Island	Region I	$1.25	Y	point of ourchase			N	N	Y	N	N	N	N		N	N					
South Carolina	Region IV	$2.00	Y	Point of purchase, new tire retailer		$1.06 to retailer if they manage the old tire $.50 to state to run tire program and grants $.44 to counties to run tire program Note: if retailer does not manage tire, the retailer gets $.06 and the county gets $1.44 and the state gets $.50.	N	Y	Y	N	Y	N	Y	N	Y	N	Local Governments	2,200,000	60,000	*note: grant average excludes demonstration grants Grant criteria: need, tonnage managed	Financial assurance requirement is $3 per tire allowed on-site under the permit.
South Dakota	Region VIII	$0.25	Y	vehicle registration at the county level		$0.25 per tire not to exceed one dollar per vehicle. This money is put into a grant fund in order to clean up waste tire piles. Fee generates about $1,000,000 per year.	UNK	N	Y	N	Y	Y	Y	Y	Y	N	Processors, End Users, Local Governments	500,000	10,000	Pretty much wide open but no retailers who collect money for disposal of tires.	
Tennessee	Region IV	$1.35	N	point of purchase		Funds are sent to counties to cover cost asssociated with tire collection centers and to pay for collection/hauling of tires from county collection centers. Counties can access a surcharge for dropping off tires at these colllection center.	Y	Y	Y	N	Y	N	N		N	N					
Texas	Region VI		N				N	Y	Y	N	Y	Y	N		N	N					None
Utah	Region VIII	$1.00	N	dealers collect on new tires sold and new cars	7/1/2010	The fee is used to pay a reimbusement for recycling at $90.00 per ton for crumb, $75.00 per ton for TDF and other recycling, and $45.00 for Benefical use (landfill daily cover and engineering uses). The fee also pays the local health departments $5.00 per ton for each ton recycled and for one FTE at the Division of Solid and Hazardous Waste.	N	Y	Y	Y	Y	Y	Y	Y	N	N					Landfilling of tire is allowed when received at the disposal facility 4 at a time. Landfilling of shredded tires is allowed when in a monofill and disposed so the tire shreds would be clean and available for recycling.
Virginia	Region III	$1.00	N	tire retailer		Again in 2008, our elevated fee (from 50 cents to $1 in 2003) was extended 3 more years to 2011. The extra money is solely for tire pile cleanups. 100% to the waste tire effort; compliance, enforcement, pile cleanups and end user reimbursements.	N	Y	Y	N	Y	N	Y	Y	Y	N	End Users	2,000,000	23	Our End User Reimbursement program pays up to $22.50 per ton for documented Virginia-generated waste tires used as TDF, CF and Ground Rubber. We pay up to $100 per ton for tires from piles.	Again in 2008, our elevated fee (from 50 cents to $1 in 2003) was extended 3 more years to 2011. The extra money is solely for tire pile cleanups. No trends or major changes have occurred in 2005-2007, except that Tire Energy Corp. in Martinsville closed in July 2007. This was quickly made up by TDF uses in NC.
Vermont	Region I		N				N	Y	Y	N	N	N	N		N	N					
Washington	Region X	$1.00	Y	Tire retailer	6/30/2010	$1 fee is collected for sale of new replacement tires. Collected by tire retailers. Funds go to scrap tire cleanup efforts.	N	Y	Y	Y	Y	N	Y	Y	N	Y					Financial assurance is required for storage of 800+ passenger tires (or combined weight of 8 tons of mixed of tire types). Value of Financial Assurance determined based on cost to cleanup maximum number of tires stored.
Wisconsin	Region V		N				N	Y	Y	N	N	N	N		N	N					
West Virginia	Region III	$5.00	N	Manchin Fund collected by DMV vehicle titles		$5 collected each time a vehicle is titled. All proceeds from gund go to DEP for waste tire collection and cleanup projects	N	Y	Y	N	Y	Y	N		UNK	UNK					
Wyoming	Region VIII		N				N	N	Y	Y	Y	Y	N		UNK	N					