

**Hawaii State Department of Health
Tire Recycling for Land Application Interim Policy
May 6, 2009**

This document was prepared by the Department of Health, Solid and Hazardous Waste Branch (SHWB), with consultation and concurrence by the Hazard Evaluation and Emergency Response (HEER) Office. The document evaluates tire recycling for land application in Hawaii. This interim document is issued on an initial trial basis, and is provided to other agencies and stakeholders for their consideration.

The document contains the following sections:

Section 1	Regulatory Background
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Section 3	Current Retail Availability of Tire Shred Products
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Section 1 - Regulatory Background

Scrap tire stockpiles pose an environmental problem in Hawaii, as well as throughout the country. The stockpiles have the potential to be a mosquito breeding ground, as well as a potential fire hazard. Tire fires in Hawaii have occurred on several occasions, most at tire recycling facilities, but one of the larger fires occurred at a location in Maili where large quantities of chipped tires were stored. Tire fires may cause contamination (air, soil, water) and have negative impacts on human health and the environment. It is estimated that 500,000 - 1,000,000 waste tires are generated in Hawaii each year.

Hawaii Revised Statutes (HRS) Chapter 342I , Part II, *Used Motor Vehicle Tire Recovery*, provides statutory guidelines for the disposal and recycling of used tires. According to HRS 342I-22(a), "*No persons shall place a whole motor vehicle tire in mixed municipal solid waste, or shall discard or otherwise dispose of a motor vehicle tire except by delivery to any motor vehicle tire retailer, tire wholesaler, or to an authorized tire collection or authorized tire recycler.*" According to HRS 342I-21, an "*Authorized tire recycler*" means any processor, shredder, or manufacturer permitted by the department under 342H as a tire recycling facility. The SHWB issues permits to identify "authorized tire recyclers."

The SHWB reviews permit applications from tire recyclers and issues permits accordingly. As part of this process, the SHWB evaluates whether proposed operations are in the public interest, and considers the environmental impacts of the proposed action. DOH encourages recycling of waste materials instead of disposal. Higher ends of recycling, such as feedstock to manufactured product or alternative fuel, are favored over land application. The permitting process seeks to establish measures to ensure that any waste accepted at a facility will be

recycled or disposed of in a timely manner that is protective of human health and the environment.

Section 2 - Tire Recycling for Land Application in Hawaii

A permit applicant submitted a request to the SHWB, proposing to shred waste tires and sell the resultant pieces as product. The applicant indicated that the shredded pieces could be used in various applications, such as ground/track cover and drain rock. The SHWB indicated that we could not allow such applications without additional information (potential leaching of various constituents, potential for compression or compaction, durability, presence of protruding wires, etc.) to evaluate their proposals. The SHWB was unable to issue a solid waste permit that allows a facility to accept waste tires, without a recycling end market.

The applicant indicated that tire shreds are imported and available for sale at retail stores in Hawaii. The SHWB indicated that it would re-evaluate its position on the resale of tire shreds.

Section 3 - Current Retail Availability of Tire Shred Products

The SHWB visited three (3) stores on Oahu: Home Depot, Lowe's, and WalMart. Each store sells 'Shredded Rubber Mulch' in 0.8 cubic foot bags for landscaping purposes. A summary of the products are shown below.

Table 1 – Comparison of 0.8 cubic foot (cf) Bags of "Rubber Mulch" at Retail Stores

Store	Home Depot	Lowe's*	Walmart*
Manufacturer	Vigoro/Home Depot	DuPont	Majestic
Product Description	100% Recycled Tires, 99.9% Wire Free	100% Recycled Product	100% Recycled Rubber from Automotive Tires 99.9% Wire Free
Application Description	Landscape: 1.5" deep Playground: 6" deep	Landscape: 1" deep Playground: 6" deep	Landscape: 1"-1.5" deep Playground: 2" - 6" deep
Certifications	IPEMA, ASTM F1292	IPEMA, ASTM F1292-04, ASTM F1951-99	IPEMA, ASTM F1292
Paint	12-year warranty	15-year warranty	12-year warranty
Cost	\$11.97/0.8 cf	\$13.16/0.8 cf (red) \$9.19/0.8 cf (earth tone)	\$8.58/cf

Information obtained from product located at stores on April 9, 2009 and manufacturing company websites in April 2009 (Attachment III)

*Material Safety Data Sheets are included as Attachment III.

IPEMA – International Play Equipment Manufacturers Association

ASTM International, formerly known as American Society for Testing and Materials

Section 4 - EPA Guidance

As with other types of solid waste, the EPA supports the use of waste tires in accordance with the waste management hierarchy: reduce, reuse, recycle, waste-to-energy, and disposal. The EPA does not consider the disposal of scrap tires in piles as an acceptable management practice.

While there are no federal programs regulating waste tire recycling and disposal, the EPA website reflects their support for using scrap tires in civil engineering applications. A selection from their website is included as Attachment I of this document. According to the website, 39 states approve tire shreds for civil engineering applications. The website also includes links to civil engineering and environmental studies conducted on the reuse of scrap tires.

The EPA does not have regulations specifically regarding the proper management, reuse, and disposal of waste tires. The tires are considered a solid waste and are managed by individual states. Forty-eight (48) states have adopted rules regarding waste tire management. The rules typically include guidelines regarding licensing requirements, limitations on who may handle scrap tires, and financial assurance requirements for scrap tire handlers. The State of Hawaii regulates tire recyclers by issuing solid waste management permits, which include requirements aimed at preventing the accumulation of tire and shredded tire stockpiles, and allowing viable recycling alternatives or proper disposal procedures.

It should be noted that the EPA also strongly promoted the reuse and recycling of coal ash, providing studies on the beneficial aspects of ash recycling. As with the waste tires, individual states were responsible for the management of this waste stream. In December 2008, a coal ash spill occurred in eastern Tennessee. Approximately 300 acres of land and nearby waterways were impacted by a coal ash release. As a result of this incident, the EPA is re-evaluating their position on coal ash and may issue federal regulations regarding this waste stream. Coal ash recycling facilities in Oahu may be impacted by the federal decisions and be required to change practices previously approved by the state. While EPA is not proposing regulations on waste tires at this time, tire recycling facilities should be aware of this possibility which may affect their industry and investment.

Section 5 - DOH Technical Evaluation

According to the EPA website, "There is no current evidence showing that products containing recycled rubber from scrap tires substantially increases the threat to human health and the environment as compared to the threats associated with conventional products." The state supports the recycling of waste as a replacement for virgin materials with similar constituents. The shredded tire chips are expected to have similar constituents as new rubber products. One study indicates that leachate from rubber contains constituents at lower levels than asphalt leachate.

In the past, toxicologists with the HEER Office expressed a concern regarding potential human health risks associated with unregulated use of tire shred material. National studies conducted on tire shreds primarily focus on civil engineering aspects of tire recycling, rather than public health and environmental risk. According to the Rubber Manufacturer's Association, approximately 75% of all civil engineering use is concentrated in eight states (Texas, North Carolina, Virginia, Iowa, Minnesota, Ohio, South Carolina, and Maine).

Since the original DOH concern regarding tire shred use, additional studies have been performed throughout the country and EPA has increased their apparent support for tire recycling. The environmental studies evaluate the total metals content, leaching potential, and

potential risk to human health and the environment. The studies appear to show varying results regarding the potential for heavy metals to leach from shredded tires and the potential risk associated with polynuclear aromatic hydrocarbons and other contaminants. However, they generally conclude that the risk to human health and the environment is acceptable. A summary of these studies, as referenced on the EPA website, is included as Attachment II. A copy of these studies may be downloaded from the EPA website or obtained from the SHWB upon request.

According to the EPA, some states do not allow tire shreds to be placed below the water table, to prevent potential water quality concerns. The DOH also believes that tire shreds should not be placed in water or below the groundwater table.

Section 6 - Considerations on Production Quantity

Often times recycling, especially in the form of land application, is used as a guise to avoid disposal costs. While the small quantities that are sold through the local stores and the associated costs limit the likelihood for large disposal sites for chipped tires, we believe that there is a potential for the shreds to hit market saturation. Unlike greenwaste mulch that is used for landscaping, as is a described use for tire shreds, tires do not readily decompose, so additional tire shreds will not be needed. Bulk uses should be further scrutinized to ensure that it will be used for a specific purpose rather than a guise for disposal. As mentioned earlier, tires, including tire chips, are a potential fire hazard, and a large disposal site may cause public health risks.

Once the material is sold to the public, the Department of Health, Solid and Hazardous Waste Branch will have no regulatory control over the material. Unlike greenwaste mulch or compost, tire chips will not readily decompose and will remain at the site it was originally placed. The tire chips may also be transferred and used at another location, without any regulatory oversight. This situation may occur when an original site is developed and excavated material is transported to other locations. It should be noted that the DOH will not monitor or enforce the placement of tire shreds after it is sold as a product.

Section 7 - DOH Recommendation

Tire shred use is a widespread recycling alternative. The DOH would recommend the following basic guidelines:

- Guideline 1: The tire shred product shall be 99% wire free (by weight).
- Rationale: Since the tires shreds may be used at playgrounds, the wires may pose a physical hazard to children. In addition, the wires are an extra source of heavy metals that may leach into the environment. The products identified at retailers are 99.9% wire free.
- Verification: No visible wire shall be present on tire shreds. In addition, representative samples of the tire shreds shall be submitted to a third-party analytical laboratory for gradation testing and determination of percentage of free wire. The tire shred manufacturing process must be carefully detailed to ensure that the product is consistent. The first sampling collection event shall be conducted by a third-party consultant. Regular, periodic testing may be used to verify the product as equipment functionality may change over time.

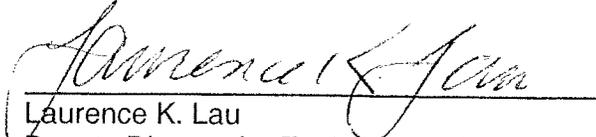
- Guideline 2: The tire shred product shall meet ASTM Standard F1292 and be certified by IPEMA. If the tire shreds will not be used at playgrounds, the IPEMA certification is not necessary. However, any entity receiving the product must be given written notification that the material is not approved for use at playgrounds. The DOH requires that the facility show that the product meets ASTM standards.
- Rationale: Tire shred products manufactured in the state shall be of similar, or better, quality than their counterparts.
- Verification: According to the ASTM website, Northwest Laboratories of Seattle performs the testing protocol. Please consult the ASTM website for additional information about the standard and laboratories.
- Qualification: This requirement provides DOH a basis to show that the shredded tires are a "product" and no longer a waste. The DOH did not evaluate and is not providing approval for the specific use of tire shreds as playground surfaces. A study produced by the California Integrated Waste Management Board identified a 69% failure rate for rubberized California playground surfaces using impact attenuation standards. In addition, site conditions (such as temperature changes throughout the day), contractor installation practices, and post-construction certifications affect the safety associated with this practice.
- Guideline 3: The tire shreds may only be used in volumes of less than one cubic yard (27 cubic feet). This is the equivalent of approximately 34 bags currently sold at stores. If an entity proposes to use more than one cubic yard of tire shreds, DOH approval is required prior to its use. The DOH will consider the location, quantity, and proposed function of the tire shreds in its evaluation.
- Rationale: The DOH will conduct the case-by-case evaluation to ensure that the tire shreds are serving a beneficial purpose, and are not being sent for sham recycling. The potential for placement below the groundwater table is most likely in large volume applications.
- Guideline 4: The facility shall have reasonable limits on the quantities of whole tires and tire shred product. The DOH will work with the facility to establish these requirements, based on environmental controls at the site.
- Example: An example of a capacity limit would be 2,000 whole tires (approximately 2,500 cubic feet) and 5,000 cubic feet of shredded tires at the facility. Note that 5,000 cubic feet of shredded tires is comparable to approximately 7,500 shredded tires, or over three times the capacity limit for whole tires. It does not limit the annual throughput at the facility. This allows the facility to produce a large volume of tire shreds to provide to potential clients. Conversely, in the event that an end-market cannot be identified, this is a manageable quantity of tires to send to other in-state recyclers for other uses such as alternative fuel, or out-of-state recyclers.
- Rationale: If the quantity of whole and shredded tires meets this capacity limit, the facility should cease accepting tires until end markets can be found for the product. This limitation ensures that tires will be managed appropriately and a "tire stockpile" will not be created. According to EPA's *Scrap Tire Cleanup Guidebook*, January 2006, "stockpiles at operating processors have to be controlled."

Section 8 - Limitations

The recommendations presented in this paper allow a facility to shred waste tires and sell the shredded material as product. It does not approve the use of shredded tires in any specific

manner. The structural aspects of shredded tires were not evaluated. The facility or end-users are responsible for compliance with any other federal, state, or county rules and regulations. For example, this position shall not be construed as approval for septic tank applications or as fill in engineered applications.

ACCEPTED:



Laurence K. Lau
Deputy Director for Environmental Health



Date

ATTACHMENT I
Sections from EPA Website



Wastes - Resource Conservation - Common Wastes & Materials - Scrap Tires

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[Scrap Tires](#)

Scrap Tires

There are at least 275 million scrap tires in stockpiles in the U.S. In addition, approximately 290 million scrap tires were generated in 2003.



Markets now exist for about 80 percent of scrap tires - up from 17 percent in 1990. The states have played a major role in tackling this problem by regulating the hauling, processing, and storage of scrap tires; and by working with industry to recycle and beneficially use scrap tires, through developing markets for the collected scrap tires.

This website provides general information on scrap tires, including:

- [Where You Live](#) - links to state and EPA regional information
- [Basic Information](#) - overview and statistics on scrap tire management, information about tire pile cleanup.
- [Markets](#) - overview of scrap tire markets. Three large markets are described in additional detail: [tire-derived fuel](#), [civil engineering](#), and [ground rubber](#) used in highways and other applications.
- [Laws/statutes](#) - particularly, state scrap tire legislation and programs
- [Science/technology](#) - innovative uses of scrap tires
- [Frequent Questions, publications, and related links](#)
- [RCC Scrap Tire Workgroup](#) - overview, goals and action plans

Basic Information

[Markets and Uses for Scrap Tires](#) | [Landfill Disposal](#) | [Stockpiles and Illegal Dumping](#) | [Scrap Tire Cleanup Guide](#) | [State and Local Governments](#) | [Health and Environmental Concerns](#)

At the end of 2003, the U.S. generated approximately 290 million scrap tires. Historically, these scrap tires took up space in landfills or provided breeding grounds for mosquitoes and rodents when stockpiled or illegally dumped. Fortunately, markets now exist for 80.4% of these scrap tires-up from 17% in 1990. These markets-both recycling and beneficial use-continue to grow. The remaining scrap tires are still stockpiled or landfilled, however.

In 2003, markets for scrap tires were consuming 233 million, or 80.4 %, of the 290 million annually generated scrap tires:

- 130 million (44.7%) are used as fuel
- 56 million (19.4%) are recycled or used in civil engineering projects
- 18 million (7.8%) are converted into ground rubber and recycled into products
- 12 million (4.3%) are converted into ground rubber and used in rubber-modified asphalt
- 9 million (3.1%) are exported*
- 6.5 million (2.0 %) are recycled into cut/stamped/punched products
- 3 million (1.7%) are used in agricultural and miscellaneous uses

Another 16.5 million scrap tires are retreaded. After any retreading has been performed, 290 million scrap tires are generated. About 27 million scrap tires (9.3%) are estimated to be disposed of in landfills or monofills. (*Source: Rubber Manufacturers Association, 2004.*)

*Many scrap tires are exported to foreign countries to be reused as retreads, especially in countries with growing populations of automobile drivers such as Japan and Mexico. According to Mexico's National Association of Tire Distributors, as many as 20% of tires sold in Mexico are imported as used tires from the US and then retreaded for reuse. Some foreign countries also import tires to be shredded and used as crumb rubber, or to be used as fuel.

Unfortunately, not all exported tires are reused or recycled. The downside of

exporting scrap tires is that the receiving countries may end up with a disproportionate amount of tires, in addition to their own internally-generated scrap tires.

Markets and Uses for Scrap Tires

"Over 75% of scrap tires are recycled or are beneficially used for fuel or other applications."

- Rubber Manufacturers Association, 2003

Scrap tires are used in a number of productive and environmentally safe applications. From 1990 through 2003, the total number of scrap tires going to market increased from 11 million (24.5%) of the 223 million generated to 233 million (80.4%) of the 290 million generated.

The 3 largest scrap tire markets are:

- Tire-derived fuel
- Civil engineering applications
- Ground rubber applications/rubberized asphalt

Many uses have been found for recycled tires including whole tires, tires chips, shredded tires, and ground rubber. Retreading also saves millions of scrap tires from being disposed of as scrap each year.

More information on scrap tire markets and uses.

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Landfill Disposal

Even with all of the reuse and recycling efforts, almost one quarter of scrap tires end up in landfills each year. Landfilling scrap tires can cause problems due to their uneven settlement and tendency to rise to the surface, which can harm landfill covers. To minimize these problems, many states require chipping or grinding of tires prior to disposal. Sometimes scrap tires are also incorporated into the landfill itself as part of daily cover, or in a landfill cap.

In recent years, the placement of shredded scrap tires in monofills—a landfill, or portion of a landfill, that is dedicated to one type of material—has become more common. Monofills may be used where no other markets are available and municipal solid waste landfills do not accept tires. Monofills are preferable to above ground storage of tires in piles, due to fire hazards and human health hazards.

State landfill regulations:

- 38 states ban whole tires from landfills.
- 35 states allow shredded tires to be placed in landfills.
- 11 states ban all tires from landfills.
- 17 states allow processed tires to be placed into monofills.
- 8 states have no restrictions on placing scrap tires in landfills.

(Source: Rubber Manufacturers Association, 2003)

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Stockpiles and Illegal Dumping

In 1994, the estimated number of scrap tires in stockpiles in the US was 700 to 800 million. Since that time, millions of tires have been removed from stockpiles primarily due to aggressive cleanup through state scrap tire management programs. 275 million tires were estimated to be in stockpiles (Source: Rubber Manufacturers Association, 2004.)

Tire Stockpiles

- A tire's physical structure, durability, and heat-retaining characteristics make these stockpiles a potential threat to human health and the environment. The curved shape of a tire allows rainwater to collect and creates an ideal habitat for rodents and mosquitoes.
- Prone to heat retention, tires in stockpiles also can ignite, creating tire fires that are difficult to extinguish and can burn for months, generating unhealthy smoke and toxic oils. Illegal tire dumping pollutes ravines, woods, deserts, and empty lots. For these reasons, most states have passed scrap tire regulations requiring proper management.

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Scrap Tire Cleanup Guidebook

To help state and local governments reduce the economic burdens and environmental risks associated with scrap tire piles on their landscapes, U.S. EPA Region 5 and Illinois EPA, with input from members of the national Resource Conservation Challenge Scrap Tire Workgroup, have collaborated to create the Scrap Tire Cleanup Guidebook. The guidebook brings together the experience of dozens of professionals in one resource designed to provide state and local officials with the information needed to effectively clean up scrap tire piles. The guidebook discusses starting a cleanup program, working with contractors to clean up sites, and implementing prevention programs that will reduce scrap tire dumping.

Order a printed copy of the Guidebook (Use EPA ID #530R06001)

Scrap tire piles are not treated as hazardous waste. However, once a tire fire occurs, tires break down into hazardous compounds including gases, heavy metals, and oil which may then trigger Superfund cleanup status.

State Survey

Based on a survey of state agencies conducted by the Rubber Manufacturers Association in 2001, 91% of all scrap tires stockpiled in the US are concentrated in eleven states. For additional information, see the 2003 RMA study on scrap tire markets [EXIT Disclaimer](#).

Tire piles/dumps can be found in big cities, small towns, and the countryside.

Cleaning up these nuisance piles is time consuming and expensive. In an effort to limit dumping and stockpiling, most states have passed scrap tire regulations requiring proper management.

Many states have cleaned up large numbers of tire stockpiles. Minnesota, Wisconsin, and Maryland are three states which report having cleaned up all scrap tire stockpiles.

For more information about illegal dumping, consult EPA's Illegal Dumping Prevention Guidebook (PDF) (33 pp, 1.1MB, [About PDF](#))

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State and Local Governments

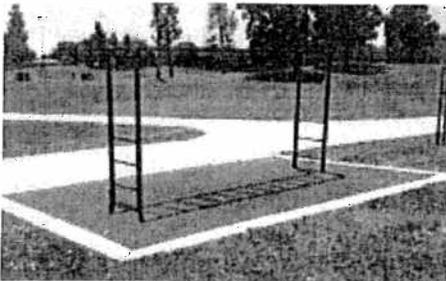
Scrap tires, as a solid waste, are regulated primarily by state governments.

Currently, 48 states have laws or regulations specifically dealing with scrap tires.

While each state has its own program, some common features include:

- a source of funding for the program
- licensing or registration requirements for scrap tire haulers, processors and some end users;
- manifests for scrap tire shipments;
- limitations on who may handle scrap tires;
- financial assurance requirements for scrap tire handlers; and
- market development activities.

Local municipalities help educate the public about illegal dumping and enforce anti-tire dumping laws. Local agencies are also usually responsible for tire pile cleanup



Magic Johnson Park, Los Angeles, California. Poured in-place rubber made from recycled scrap tires.

Some local jurisdictions encourage proper disposal by allowing local citizens to drop off limited numbers of tires at recycling centers, or conduct tire amnesty days where any local citizen can bring a limited number of tires to a drop-off site free of charge. State scrap tire programs may provide financial help to fund such events.

Local municipalities also play big role in procuring products made with scrap tires including playground/park applications. And in many states, local government agencies are also large users of rubberized asphalt in public paving projects. The Federal government is also a large purchaser of products made with recycled rubber, and has established purchasing guidelines.

For more information about state scrap tire programs, consult EPA's [State Scrap Tire Reference Guide \(PDF\)](#) (53 pp, 262K, [About PDF](#)).

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Health and Environmental Concerns

Tire piles-legal or illegal-pose two major health threats: pests and fire.



Burning Pile of Tires

Disease carrying pests such as rodents may live in tire piles. Mosquitoes can also breed in the stagnant water that collects inside tires. Several varieties of mosquitoes can carry deadly diseases, including encephalitis and dengue fever. Mosquito control and eradication programs-short of removing tire piles-are difficult. For more information on mosquito-borne diseases, visit the [Centers for Disease Control and Prevention](#).

Fire presents a second concern. Scrap tire fires are difficult to extinguish, and can burn for long periods. Tire fires release thick black smoke and can contaminate the soil with an oily residue. Tire fires generally start either as a result of arson or accident. [More information on tire fires](#).

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Last updated on Wednesday, September 24th, 2008.

<http://www.epa.gov/osw/consERVE/materials/tires/basic.htm>

[Print As-Is](#)



<http://www.epa.gov/osw/conserves/materials/tires/markets.htm>

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Markets/Uses

Scrap Tire Markets

The 3 largest scrap tire markets are:

- [Tire derived fuel](#)
- [Civil engineering applications](#)
- [Ground rubber applications/rubberized asphalt](#)

Other applications include:

- [Whole Tires and Cut, Stamped, and Punched Products](#)
- [Reuse-Retreading](#)
- [Pyrolysis](#)



Bulldozer Pushing Scrap Tires

Both recycling and beneficial use of scrap tires has expanded greatly in the last decade through increased emphasis on recycling and beneficial use by state, local and Federal governments, industry, and other associations.

Unfortunately, even with all of the reuse and recycling efforts underway, not all scrap tires can be used beneficially. [More information on scrap tire disposal.](#)

Whole Tires and Cut, Stamped, and Punched Products

Scrap tires may be recycled by cutting, punching, or stamping them into various rubber products after removal of the steel bead. Products include floor mats, belts, gaskets, shoe soles, dock bumpers, seals, muffler hangers, shims, and washers.

Whole tires may be recycled or reused as highway crash barriers, for boat bumpers at marine docks, and for a variety of agricultural purposes.

For additional information on reuse and recycling of scrap tires, see:

- [Comprehensive Procurement Guidelines \(CPG\)](#)
The site includes EPA's list of [designated products](#) and the accompanying recycled-content recommendations. In order to find out some of the products that can be made from recovered scrap rubber, review the appropriate product guidelines such as [floor tiles and patio blocks](#), [playground surfaces](#), [running tracks](#), and [retreaded tires](#).
- [Environmentally Preferable Purchasing \(EPP\)](#)
This Web site includes an [online searchable database](#) of environmental information for environmentally preferable products including tires and products made from recycled tires.
- [Product Stewardship/Extended Product Responsibility: Vehicles](#)
Product stewardship is a product-centered approach to environmental protection. Also known as extended product responsibility (EPR), product stewardship calls on those in the product life cycle-manufacturers, retailers, users, and disposers-to share responsibility for reducing the environmental impacts of products.

Reuse-Retreading

Another market for scrap tires is retreading. Retreading involves removing the outside, or tread, of the tire and adding a new tread. Retreading saves millions of gallons of oil each year, because it takes only 7 gallons of oil to retread a used tire compared to 22 gallons to produce a new tire.

Retread tires not only offer considerable environmental and economic benefits, but they also provide quality, comfort, and safety comparable to that of new tires.

The [Tire Retread Information Bureau](#) [\[EXIT Disclaimer\]](#) estimates that about 24 million tires are retread and sold each year in the U.S. and Canada, combined. The Rubber Manufacturing Association estimates that in the US, about 16 million scrap tires were retreaded in 2001. Most are used by the trucking, aircraft, construction, and agriculture industries, and on US government vehicles. Benefits of retreading are that it:

- Saves resources by requiring 70% less oil for production.
- Contains 75% post-consumer material.
- Costs 30% to 70% less than making a new tire.
- Saves landfill space.

The 290 million scrap tires generated in 2003 do not include the 16.5 million scrap tires that were retreaded.

Pyrolysis

Another potential use for scrap tires that has been considered by many, is a chemical process that breaks tire material down into usable products including oil, gas, and carbon black through pyrolysis. Although carefully studied for over 10 years, tire pyrolysis has not been shown to be commercially viable. [More information on tire pyrolysis.](#)



<http://www.epa.gov/osw/conserves/materials/tires/tdf.htm>

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Tire-Derived Fuel

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Background

Scrap tires are used as fuel because of their high heating value. Using scrap tires is not recycling, but is considered a beneficial use - it is better to recover the energy from a tire rather than landfill it. In 2003, 130 million scrap tires were used as fuel (about 45% of all generated) - up from 25.9 million (10.7% of all generated) in 1991.

Tires can be used as fuel either in shredded form - known as tire-derived fuel (TDF) - or whole, depending on the type of combustion device. Scrap tires are typically used as a supplement to traditional fuels such as coal or wood. Generally, tires need to be reduced in size to fit in most combustion units. Besides size reduction, use of TDF may require additional physical processing, such as de-wiring.

There are several advantages to using tires as fuel:

- Tires produce the same amount of energy as oil and 25% more energy than coal
- The ash residues from TDF may contain a lower heavy metals content than some coals.
- Results in lower NOx emissions when compared to many U.S. coals, particularly the high-sulfur coals.

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 tire piles can provide habitats for disease vectors, such as mosquitoes.

In 2003, more than 290 million scrap tires were generated in the U.S. Nearly 100 million of these tires were recycled into new products and 130 million were reused as tire-derived fuel (TDF) in various industrial facilities. 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.

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. EPA testing shows that TDF has a higher BTU value than coal. The Agency supports the responsible use

Tire-Derived Fuel Frequent Questions

1. Why use tires as fuel when there are other ways to recycle scrap tires?
2. What are the trends of scrap tires used as fuel versus other market applications?
3. What are the benefits of using tires as fuel?
4. How do stack emissions vary from facilities that use TDF versus conventional fuels?
5. What is the extent of dioxin/furan emissions from cement kilns or other facilities that use TDF?
6. What are the emission and performance standards for facilities that use TDF?
7. How is TDF regulated prior to processing?
8. Have any standards been developed for the physical characteristics of TDF?

Background: Tire chips were used as a blended fuel at the Utilicorp United Power Plant in Sibley, MO. Visit Missouri's Division of Environmental Quality [\[Exit Disclaimer\]](#) for more information.

of tires in portland cement kilns and other industrial facilities, so long as the candidate facilities: (1) have a tire storage and handling plan; (2) have secured a permit for all applicable state and federal environmental programs; and (3) are in compliance with all the requirements of that permit.

This information is also contained in a [printable fact sheet on TDF \(PDF\)](#) (1 pg, 12K, [About PDF](#))

Cement Industry

About 53 million tires per year are

consumed as fuel in US cement kilns. The cement industry burns scrap tires as fuel in kilns used to make clinker—a primary component of portland cement. A cement kiln is basically a large furnace in which limestone, clay, and shale are heated at extreme temperatures and a chemical reaction transforms them into clinker. Clinker is ground together with gypsum to form Portland cement.

Scrap Tire Fuel Use by Industry

Of the 130 million scrap tires used as fuel per year:

- Cement industry - 41%
- Pulp and paper mills - 20%
- Electric utilities - 18%
- Industrial/institutional boilers - 13%
- Dedicated tire-to-energy facilities - 8%

- Rubber Manufacturers Association, 2004

The use of whole tires as kiln fuel is possible for some type of cement kilns. For these cement kilns, truck loads of whole tires, usually in enclosed vans, are delivered to the end of a conveyor. Tires are manually unloaded from the truck onto the conveyor. The conveyor feeds the tires to a mechanism that inserts one tire at a time into the kiln at specified time intervals. The advantage of utilizing whole tires is that there are no costs to create tire chips. The removal of the steel is unnecessary since cement kilns have a need for iron in their processes. Tire chips may also be utilized because there is very little manual labor involved in handling chips versus whole tires, however, producing chips from whole tires increase costs.

Pulp and Paper Industry

About 26 million tires per year are consumed as fuel in boilers at US pulp and paper mills. Pulp and paper mills have large boilers which are used to supply energy for making paper. This energy is normally supplied by wood waste, however, wood varies substantially in heat values and moisture content, so the mills often supplement the wood fuel with other fuels, such as coal or oil, to make the operation more stable. TDF is also used in many plants as a supplement to the wood because of its high heat value and low moisture content.

The main problem in using TDF in the paper industry is the need to use de-wired tires. The wires often clog the feed systems. Also, the mills sometimes sell the resulting ash to farmers who require the ash to be free of iron. De-wired TDF can cost up to 50 % more than regular TDF.

Electric Utilities

About 24 million tires per year are consumed as fuel in boilers at electric utilities. In the electric utility industry, boilers typically burn coal to generate electricity. TDF is often used as a supplement fuel in electric utility boilers because of its higher heating value, lower NOx emissions, and competitive cost as compared to coal. However, only certain types of boilers are conducive to burning TDF.

Cyclone boilers are the most used of all the utility boilers for burning TDF. They are good because they require no changes to be made to the boiler itself which reduces the capital investment. Therefore, the only additional equipment needed is a conveyor to transport the tire pieces into the boiler. Cyclone boilers cannot accept whole tires which increases the cost

of obtaining the fuel (the optimum size of the tire pieces is 1 inch x 1 inch and it must be de-wired). Stoker fired units are also economical. In the stoker boilers, the residence time of the fuel is longer so larger tire pieces can be used. The optimum size of these pieces is 2 inches square. This reduces the cost of obtaining the fuel for Cyclone boilers and makes it more economical.

Industrial/Institutional Boilers

Approximately 17 million tires per year are consumed in industrial boilers.

According to a Rubber Manufacturers Association survey in 2004, 19 industrial facilities were using TDF in their boilers to supplement their fuel usage. Industrial boilers are smaller than utility boilers and typically use a variety of fuels. When utilizing TDF, tires are typically shredded. Not all boilers are compatible with TDF. Clumping and clogging are common and preclude the use of TDF in many facilities.

Another impediment is the metal in the tires - if not removed before combustion, it ends up in the ash and can create disposal problems. Each facility must evaluate the impact of TDF on their air emissions and ash disposal. Industrial facilities must apply for the appropriate permits from their state and/or local regulatory authorities before commencing operation.

Dedicated Tire-To-Energy Facilities

Approximately 10 million tires per year are consumed as fuel at dedicated tire-to-energy facilities. A dedicated tire-to-energy facility is specifically designed to burn TDF as its only fuel to create energy.

According to a Rubber Manufacturers Association survey at the end of 2003, there was only 1 dedicated tire-to-energy facility operating in the US. The dedicated tire-to-energy facility, Exeter Energy Limited in Sterling, Connecticut burns mainly whole tires and consumes 10 million tires per year. This facility serves as a major scrap tire market for scrap tires in New York and northern New Jersey. The second dedicated tire-to-energy facility in the US is located in Ford Heights, Illinois and was not in operation at the end of 2003.

Even though dedicated tire-to-energy facilities have been demonstrated to achieve emission rates much lower than most solid fuel combustors, there are no known facilities under construction or consideration. The length of time and cost of construction, as well as the deregulation of the utility industry hinders further expansion of this industry.



http://www.epa.gov/osw/conserves/materials/tires/civil_eng.htm

Last updated on Wednesday, September 24th, 2008.

Wastes - Resource Conservation - Common Wastes & Materials - Scrap Tires

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Civil Engineering Applications

The civil engineering market encompasses a wide range of uses for scrap tires. In almost all applications, scrap tire material replaces some other material currently used in construction such as lightweight fill materials like expanded shale or polystyrene insulation blocks, drainage aggregate, or even soil or clean fill.



Road embankment constructed with shredded tires in El Paso, Texas.

A considerable amount of tire shreds for civil engineering applications come from stockpile abatement projects. Tires that are reclaimed from stockpiles are usually dirtier than other sources of scrap tires and are typically rough shredded. Rough tire shreds can be used as embankment fill and in landfill projects.

39 states approve tire shreds for civil engineering applications. (Source: [Rubber Manufacturers Association](#), 2003. [EXIT Disclaimer](#))

Civil Engineering Applications

- Subgrade Fill and Embankments
- Backfill for Wall and Bridge Abutments
- Subgrade Insulation for Roads
- Landfills
- Septic System Drain Fields
- Other Uses
- Environmental Studies on Using Scrap Tires for Civil Engineering Applications

Subgrade Fill and Embankments

Tire shreds can be used to construct embankments on weak, compressible foundation soils. Tire shreds are viable in this application due to their light weight. For most projects, using tire shreds as a lightweight fill material is significantly cheaper than alternatives.

Examples of projects using scrap tires as subgrade fill and/or embankments include:

- Two highway embankments on weak clay in Portland, Maine.
- An interstate ramp across a closed landfill in Colorado.
- Mine access roads across bogs in Minnesota.
- Stabilization of a highway embankment in Topsham, Maine.
- Reconstruction of a highway shoulder in a slide prone area in Oregon.

Other uses of tire shreds: subgrade fill and embankments include retaining forest roads, protecting coastal roads from erosion, enhancing the stability of steep slopes along highways, and reinforcing shoulder areas.

For additional information, see:

- [US DOT Federal Highway Research Center, User Guidelines for Tires Shreds as Embankment or Fill](#)
- [Texas DOT Specifications for the Use of Recycled Materials](#) EXIT Disclaimer

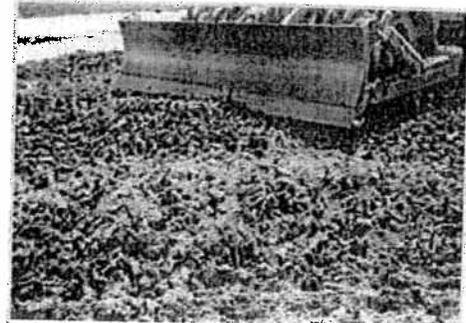
Backfill for Walls and Bridge Abutments

Tire shreds can be useful as backfill for walls and bridge abutments. The weight of the tire shreds reduces horizontal pressures and allows for construction of thinner, less expensive walls. Tire shreds can also reduce problems with water and frost build up behind walls because tire shreds are free draining and provide good thermal insulation.

Recent research has demonstrated the benefits of using tire shreds in backfill for walls and bridge abutments.

Subgrade Insulation for Roads

In northern climates, excess water is released when subgrade soils thaw in the spring. Placing a 6 to 12-inch thick tire shred layer under the road can prevent the subgrade soils from freezing in the first place. In addition, the high permeability of tire shreds allows water to drain from beneath the roads, preventing damage to road surfaces.



Shredded scrap tires used as road base in Odessa, Texas.

For more information on civil engineering applications, consult:

- ASTM specifications for use of tire shreds in civil engineering applications, specifically ASTM D6270-98-[available on the ASTM Web site](#) EXIT Disclaimer [Note: users must pay to download/view a copy of the ASTM specifications]
- state DOT engineering reports,
- leachate data, and
- training courses on highway and landfill applications.

Landfills

Landfill construction and operation is a growing market application for tire shreds. Scrap tire shreds can replace other construction materials that would have to be purchased. Scrap tires may be used as a lightweight backfill in gas venting systems, in leachate collection systems, and in operational liners. They may also be used in landfill capping and closures, and as a material for daily cover.

Septic System Drain Fields

Some states-Alabama, Florida, Georgia, South Carolina, and Virginia-allow tire shreds to be used in construction of drain fields for septic systems. Tire-derived material replaces traditional stone backfill material, but reduces the expense and labor to build the drain fields. Tire chips can also hold more water than stone and can be transported more easily due to their light weight.

Challenges to using tire shreds in drain fields include tire chip quality (tire chips must be clean cut and be of uniform size) and economics-in some areas, stone is abundant and cheap; tire shreds must be cheaper than stone to be used readily.

Other Uses

- Playground surface material

- Gravel substitute
- Drainage around building foundations and building foundation insulation
- Erosion control/rainwater runoff barriers (whole tires)
- Wetlands/marsh establishment (whole tires)
- Crash barriers around race tracks (whole tires)
- Boat bumpers at marinas (whole tires)

Environmental Studies on Using Scrap Tires in Civil Engineering Applications

A literature review was done by the University of Maine on the water quality and environmental toxicology effects of tire-derived aggregate (TDA). The review found that: "TDA has a limited effect on drinking water quality and fresh water aquatic toxicity for a range of applications including lightweight backfill for walls and bridge abutments, insulation and drainage layers beneath roads, free-draining and insulating backfill for residential foundations, vibration damping layers beneath rail lines, landfill leachate collections systems, drainage layers in landfill caps, landfill gas collection systems, and drainage aggregate for drain fields for on-site waste water treatment systems. TDA is unlikely to increase the concentration of substances with primary drinking water standards above those naturally occurring in the groundwater. It is likely that TDA will increase the concentration of iron and manganese, but the data indicates that these elements have limited ability to migrate away from the TDA installation." This literature review was requested by the [Resource Conservation Challenge](#) and was compiled by Dr. Dana Humphrey and Michael Swett of the University of Maine.

[Literature Review of the Water Quality Effects of Tire Derived Aggregate and Rubber Modified Asphalt Pavement \(PDF\)](#) (58 pp, 332K, [About PDF](#))

Several environmental studies have been performed to assess the potential for toxics to leach from tires when placed in wet soils. The impact of scrap tires on the environment varies according to the local water and soil conditions, especially pH value.

[Chelsea Center's Technical Report on Environmental Impacts of Rubber In Light Fill Applications \(PDF\)](#) (20 pp, 153K, [About PDF](#)) [EXIT Disclaimer](#)

Two studies by the University of Maine's Department of Civil Engineering on water quality of tire leachate below the ground water table showed that if the groundwater pH is near neutral (not too acidic or basic), tire shreds have only a small impact on groundwater quality.

[Field Study of Water Quality Effects of Tire Shreds Placed Below the Water Table \(PDF\)](#) (10 pp, 183K, [About PDF](#)) [EXIT Disclaimer](#)

Minnesota began using shredded tires as a lightweight fill material in 1985 on logging roads through areas with weak soils. This report documents seven sites in Minnesota that used shredded waste tires as lightweight fill. Shredded tires were proven to be a viable form of lightweight fill because they are relatively lightweight, inexpensive and non-biodegradable. (Please note that this report mentions pyrolysis as a potential market for scrap tires, but after many attempts, pyrolysis has never been proven to be economically viable in the US.)

[Using Shredded Tires as Lightweight Fill Material for Road Subgrades \(PDF\)](#) (38 pp, 327K, [About PDF](#)) [EXIT Disclaimer](#)



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[Scrap Tires](#) [Markets/Uses](#) [Ground Rubber Applications](#)

Ground Rubber Applications

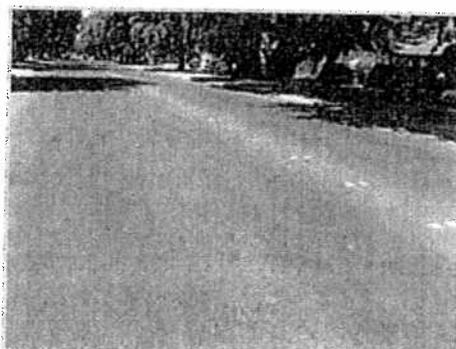
[Asphalt Rubber](#) | [Athletic and Recreational Applications](#) | [Other Uses](#)

The market for ground rubber, also referred to as sized-reduced rubber or crumb rubber, has been growing over the past several years. In the ground rubber market there are two classes of particle sizes: "ground" rubber (10 mesh and smaller) and "coarse" rubber (larger than 10 mesh, with a maximum size of one-half inch).

Asphalt Rubber

Asphalt rubber is the largest single market for ground rubber, consuming an estimated 220 million pounds, or approximately 12 million tires. California and Arizona use the most asphalt rubber in highway construction (over 80% of asphalt rubber utilized). Florida is the next largest user.

Ground tire rubber can be blended with asphalt to beneficially modify the properties of the asphalt in highway construction. Size-reduced scrap tire rubber can be used either as part of the asphalt rubber binder (a.k.a., asphalt rubber), seal coat, cap seal spray or joint and crack sealant, or as an aggregate substitution (rubber modified asphalt concrete).



Street in Modesto, California covered with rubberized asphalt.

Benefits of using asphalt rubber include:

- longer lasting road surfaces,
- reduced road maintenance,
- cost effectiveness over the long term,
- lower road noise, and
- shorter breaking distances.

Asphalt rubber is being used in greater amounts by state Departments of Transportation. Arizona and Florida have been leaders in asphalt rubber utilization. Texas and Nebraska are currently using greater amounts of asphalt rubber. South Carolina is also pursuing utilization of asphalt rubber in county and state roads. Other states that have studied and/or used rubberized asphalt include New York and New Mexico.

For additional information, see:

- [Rubberized Asphalt Concrete Technology Center \(RACTC\)](#) [EXIT Disclaimer]
- [Rubber Pavements Association](#) [EXIT Disclaimer]
- [U.S. DOT Federal Highway Research Center](#) [EXIT Disclaimer]
 - [Asphalt Concrete \(Wet Process\)](#)

- [Asphalt Concrete \(Dry Process\)](#)
- [Embankment or Fill](#)
- [Texas DOT Recycling Program](#) [\[EXIT Disclaimer\]](#) and [Texas DOT Specifications for the Use of Recycled Materials](#) [\[EXIT Disclaimer\]](#)
- [Florida - Study of the Suitability of Ground Rubber Tire as a Parking Lot Surface](#) (45 pp, 7MB, About PDF) [\[EXIT Disclaimer\]](#)

Athletic and Recreational Applications

Examples and benefits of using scrap tires in this market segment include:

- Ground cover under playground equipment – possesses high impact attenuation/ability to absorb the energy from falling children and objects.
- Running track material – increases a track's resiliency and decreases stress on runners' legs.
- Sports and playing fields – as a soil additive, increases the resiliency of the field thereby decreasing injuries, improves drainage, and enables better grass root structure.



Rubber mulch at a public playground in Pennsylvania.

For Additional Information

[Evaluation of Health Effects of Recycled Waste Tires in Playground and Track Products](#) [\[EXIT Disclaimer\]](#) - developed for the California Integrated Waste Management Board

Other Uses

Other uses for ground rubber include:

- Molded rubber products (e.g., carpet underlay, flooring material, dock bumpers, patio decks, railroad crossing blocks, livestock mats, roof walkway pads, rubber tiles and bricks, movable speed bumps).
- New tire manufacturing (up to 10% or higher as per [Scrap Tire News](#) [\[EXIT Disclaimer\]](#)).
- Brake pads and brake shoes.
- Additive to injection molded and extruded plastics.
- Automotive parts.
- Agricultural and horticultural applications/soil amendments.
- Horse arena flooring.



<http://www.epa.gov/osw/conserves/materials/tires/laws.htm>

Last updated on Monday, September 22nd, 2008.

Wastes - Resource Conservation - Common Wastes & Materials - Scrap Tires

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[Scrap Tires](#) [Laws/Statutes](#)

Laws/Statutes

Scrap tires are managed primarily at the state level. About 48 states have laws or regulations specifically dealing with the management of scrap tires. While each state has its own program, some typical features include:

- Funding via taxes or fees on automobiles or tires.
- Market development activities.
- Licensing or registration requirements for scrap tire haulers, processors and some end users.
- Manifests for scrap tire shipments.
- Requirements regarding who may handle scrap tires.
- Financial assurance requirements for scrap tire handlers, storage facilities, and disposers.
- Tire pile clean-up.



The City of Modesto Amnesty Program allows Modesto, California residents the opportunity to drop-off waste tires for recycling at no charge. Tires of all sizes are accepted.

In 1985, Minnesota enacted the first state law for the management of scrap tires. By now, 48 states have enacted laws that address scrap tire management. Alaska and Delaware do not have any scrap tire laws or regulations.

Each state makes its own scrap tire laws and regulations. These laws typically set the stage for rules for scrap tire storage, collection, processing, and use. States also establish programs to clean up old scrap tire stockpiles, and the funding needed to accomplish that goal. [More information about state tire programs.](#)

In recent years, scrap tire legislation has been a priority in many states. This is an indication that the majority of legislatures recognize that creating viable markets for scrap tires is an integral component of each state's environmental and recycling policies.

Tire Fees

Many states collect fees to fund scrap tire management programs or stockpile cleanup. Tire fees are typically assessed on the sale of new tires or on vehicle registrations. Fees generally range from \$0.50 to \$2 per passenger car tire, and truck tire fees range from \$3 to \$5.

Some scrap tire fees also help local communities establish market programs, create licensing/enforcement systems, and host tire collection programs/amnesty events. States and municipalities may also use money generated by scrap tire fees to offer grants or loans to scrap tire processors and end users of tire-derived materials.

Tire Roundtable

In New York, representatives from the scrap tire industry, tire manufacturers, environmental groups, scrap tire end-users, and the municipal recycling/solid waste sector formed a roundtable group to address the state's scrap tire problem. In January 2000, the roundtable developed a consensus document that was eventually turned into a legislative package. Key elements included:

- Dedicated tire fee to be used to fund initiatives.
- Short- and long-term market development programs.
- Consumer education programs.
- Creation of a stockpile remediation and abatement program.

Additional Information

- [State Scrap Tire Programs – A Quick Reference Guide: 1999 Update](#) (53 pp, 262K, [About PDF](#))
- [Rubber Manufacturers Association Table of State Legislation of Scrap Tires](#) [EXIT Disclaimer](#)
- [Rubber Manufacturers Association State Scrap Tire Fees and Point of Collection](#) [EXIT Disclaimer](#)

California IWMB

California's Integrated Waste Management Board is using a multi-tiered approach to tackle the state's tire problems:

- Identify illegal tire piles for cleanup and provide the funds to accomplish the job.
- Develop markets—enhance end products through the establishment of special recycling zones and grants.
- Conduct balanced enforcement action through scrap tire hauler licenses, public education and by targeting recyclers, collectors, and processors that are not in compliance.
- Enforce requirements regarding pile size, storage time, and fire prevention at permitted tire storage sites.



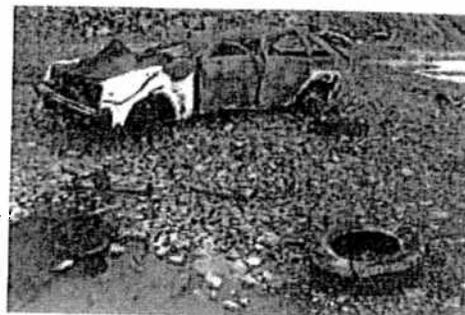
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[Scrap Tires](#) [Frequent Questions](#)

Frequent Questions

Answers to commonly asked questions about scrap tires are provided below. In many cases, links to additional information are also provided.

1. [I have a few tires at home. How can I recycle them?](#)
2. [What is the current status of tire recycling and disposal in the U.S.?](#)
3. [What do EPA and State and local governments do to ensure that tire incineration facilities are safe?](#)
4. [What is the states' experience with tire-derived fuel \(TDF\)?](#)
5. [I want to start a company to recycle or dispose of scrap tires. How do I get into the tire/rubber recycling business?](#)
6. [Where can I get a grant or a loan for the purpose of starting a company to recycle or dispose of scrap tires?](#)
7. [What permits do I need to start a company to recycle or dispose of scrap tires?](#)
8. [What types of pollution results from tire fires?](#)
9. [What are the state regulations on scrap tires?](#)
10. [What are some innovative ways tires can be recycled?](#)
11. [What is the status of scrap tire rubber being used in highways?](#)
12. [Can scrap tires be recycled into new tires?](#)
13. [What can I do to help?](#)
14. [When tires are used in new products that come in contact with soil or water, do they pollute the environment?](#)
15. [What are the benefits of recycling scrap tires?](#)
16. [What are the benefits of incinerating scrap tires for energy recovery?](#)
17. [Why do I have to pay tire disposal fees? What is the money used for?](#)
18. [Does EPA certify tire recyclers?](#)
19. [Does EPA certify products with recycled tire content?](#)
20. [Is there a risk to human health from tire piles?](#)
21. [What products are made from tires?](#)
22. [What can you tell me about pyrolysis?](#)

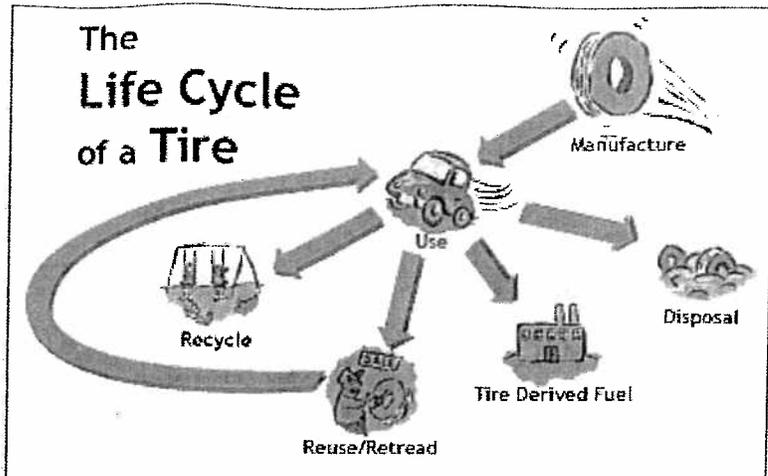


1. I have a few tires at home. How can I recycle them?

You may be able to return surplus tires to either a tire retailer or a local recycling facility that accepts tires. Be sure to confirm that the facility accepts tires for recycling and check for quantity and size limitations. Some local municipalities will also periodically conduct "tire amnesty days" when any local citizen can bring a limited number of tires to a drop-off site free of charge. For more information, or if you have large numbers of scrap tires, contact your local solid waste management agency.

2. What is the current status of tire recycling and disposal in the US*?

Number of scrap tires generated annually:	290 million
Percentage of total solid waste generated:	2.0 percent



Number of scrap tires going to a market:	233 million
Number of scrap tires used for fuel:	130 million
Number of scrap tires used in civil engineering projects:	56 million
Number of scrap tires used in ground rubber applications:	28 million
Number of scrap tires punched/stamped into new products:	7 million
Number of tires exported:	9 million
Number of tires in stockpiles:	265 million

**2003 statistics, Rubber Manufacturers Association*

More information on the current status of scrap tire management and recycling in the US

3. What do EPA and State and local governments do to ensure that tire incineration facilities are safe?

Facilities such as cement kilns, pulp and paper plants, and industrial and institutional boilers must be permitted, to ensure that any air emissions from these processes are within allowable limits.

Based on the results of EPA's 1997 study on Air Emissions from Scrap Tire Combustion (PDF) (117 pp, 650K, About PDF), it was concluded that potential emissions from tire-derived fuel are often less and generally within the same range as emissions from conventional fossil fuels, as long as combustion occurs in a well-designed, operated, and well-maintained combustion device.

In general, results from 22 industrial facilities indicate that properly designed existing solid fuel combustors can supplement their normal fuels (e.g., coal, wood, and various combinations of coal, wood, oil, coke, and sludge) with 10 to 20% TDF and still satisfy environmental compliance air emissions limits.

4. What is the states' experience with tire-derived fuel (TDF)?

Currently, more than 80 facilities in about 30 states incinerate scrap tire material for energy recovery. A total of 130 million scrap tires were used as tire-derived fuel (TDF) in 2003, up from 25 million in 1990. For more information on states' experience with TDF, see Where You Live, the Rubber Manufacturer's Association, [\[EXIT Disclaimer\]](#) and the Texas Natural Resource Conservation Commission [\[EXIT Disclaimer\]](#).

5. I want to start a company to recycle or dispose of scrap tires. How do I get into the tire/rubber recycling business?

- Investigate your specific situation—local markets, local regulations, competition.
- Develop a business plan—be specific about details—match your plan against regulatory requirements, industry standards, and market conditions.

- * Communicate with state and local regulatory agencies.

Contact your local small business assistance organization to help set up a business plan and learn about opportunities in your area.

[Learn more about scrap tire business development](#) (provided by Scrap Tire News online).

[EXIT Disclaimer](#)

6. Where can I get a grant or a loan for the purpose of starting a company to recycle or dispose of scrap tires?

The majority of funding for scrap tire management and recycling is at the state level. However, some Federal research funding is available. If you are planning to develop a new, innovative process, you may be able to obtain a grant from EPA's Small Business Innovation Research (SBIR) Program. To learn more about this program, visit the [SBIR Web site](#).

State agencies provide the majority of funding for scrap tire management and clean-up. [Contact your state agency](#) for specific information on grant/funding opportunities.

[Learn more about grants and loans.](#)

7. What permits do I need to start a company to recycle or dispose of scrap tires?

Almost every state has developed a scrap tire program, including state scrap tire laws and regulations. Generally these state programs address scrap tire collection, storage, and processing. States may require manifests for scrap tire shipments or have permitting requirements for scrap tire handlers. Facilities incinerating scrap tires for energy must obtain appropriate permits as well, from state and/or local governments. [More information about state scrap tire programs.](#)

Check with your state and local regulatory agencies for specific requirements.

[Learn more about tire laws.](#)

8. What types of pollution results from tire fires?

Tire fires can result in air pollution, and in oily runoff that can contaminate soil, surface water, and groundwater. The oily material is also highly flammable. Tire fires result in thick smoke throughout the surrounding area which can contain pollutants harmful to human health including polycyclic aromatic hydrocarbons (PAHs), benzene, styrene, phenols, and butadiene. Tire fires also threaten nearby water supplies with harmful contaminants such as lead and arsenic contained in the oily runoff.

[Learn more about tire fires.](#)

9. What are the state regulations on scrap tires?

Each state develops its own scrap tire laws and regulations. These laws typically set the rules for scrap tire storage, collection, processing, and use. Consult [EPA's Quick Reference Guide to State Scrap Tire Programs \(PDF\)](#) (53 pp, 262K, [About PDF](#)) which summarizes state scrap tire regulations and programs. Also contact state environmental regulatory agencies to learn more about [scrap tire laws in your state](#).

[Learn more about tire laws.](#)

10. What are some innovative ways tires can be recycled?

There are lots of innovative ways to recycle tires! There are currently at least 110 new products that contain recyclable tire rubber. The fastest growing markets are playground cover, soil additives (adding fine, shredded tire pieces to soil for various purposes), flooring/matting, and landfill construction material. Rubberized asphalt also uses a large number of scrap tires each year—many state departments of transportation are using tire material in highway construction.

[Learn more about innovative uses for scrap tires.](#)



Hand-crafted tire swing made from used tires.

11. What is the status of scrap tire rubber being used in highways?

The use of ground rubber from scrap tires in highways is the largest single use of recycled rubber. Currently 12 million scrap tires per year are used in highways. Both the Federal Highway Administration and a number of state environmental and transportation departments have used and investigated rubberized asphalt for highways. Arizona has been a leader in this area, while California, Connecticut, New York, and Texas have also had positive experiences with rubberized asphalt. A recent study developed by the Solid Waste Association of North America (SWANA, 2002) showed that asphalt-rubber pavement has a lower life-cycle cost than conventional pavement.

[Learn more about ground rubber applications.](#)

12. Can scrap tires be recycled into new tires?

Rubber from scrap tires can be ground and reused as a low-volume filler material in a new tire. However, ground rubber use is generally a small percentage of new tires primarily due to product quality constraints.

13. What can I do to help?

There are many things you can do to help recycle scrap tires and prevent them from ending up in the wrong places where they can do harm to the environment or to human health:

- Buy durable tires.
- Take proper care of tires by checking air inflation, driving in a manner that does not put unnecessary demand on tires, rotating the tires, balancing the wheels, and maintaining proper wheel alignment.
- Purchase used tires.
- Buy retreads.
- Support the recycled product market—look for products made with scrap tires/recycled rubber.

You can also—

Report Illegal Dumping

If you see illegal dumping taking place, copy the license plate and make of the vehicle, the time, date, and place that the dumping took place. Call your local "crimestoppers"

Maintain Proper Air Inflation!

This simple and inexpensive maintenance procedure allows tires to last much longer before they must be discarded. Maintaining proper air inflation also improves gas mileage and helps reduce auto emissions.

organization or your local law enforcement agency. You could also check the blue pages of your local telephone directory, for specific litter prevention phone numbers.

Dispose of Tires Properly

There are several ways to dispose of used tires properly:

- Leave used tires with a reputable tire dealer-a fee is usually charged for this service.
- Bring used tires to a local tire collection event for disposal.
- Call your county or local solid waste transfer station/landfill and ask if they accept used tires.
- Contact your county or local recycling center and ask if they accept used tires.

Reduce Your Usage

If everyone helps out just a little, major progress can be made toward reducing the total amount of used tires generated. Things you can do to help include:

- Purchase tires with longer tread life.
- Rotate your tires every 4,000 miles.
- Balance your tires when you rotate them.
- Check for/inflate tires to recommended air pressure levels once a month or before every long trip.
- Use public transportation and carpool.

14. When tires are used in new products that come in contact with soil or water, do they pollute the environment?

There is no current evidence showing that products containing recycled rubber from scrap tires substantially increases the threat to human health and the environment as compared to the threats associated with conventional products.

Research has been conducted on the potential effect of using scrap tires in civil engineering applications/highway construction on groundwater quality. Some states require that tire shreds not be placed below the water table, to prevent potential water quality concerns.

15. What are the benefits of recycling scrap tires?

Preferred management methods for municipal solid waste are waste prevention, followed by recycling, followed by incineration for energy recovery, and finally land disposal. For tires, retreading is a form of waste prevention and saves valuable resources. Recycling also conserves materials. For example, the use of ground rubber in products and in rubberized asphalt saves new resources from being used. In cases like these, recycling makes good economic sense.



Tire gardens can be a simple, cost-effective way to plant a garden in urban areas, and an environmentally-friendly way to turn a used tire into something productive again.

16. What are the benefits of incinerating scrap tires for energy recovery?

Incinerating tires for energy recovery utilizes scrap tires that might otherwise be landfilled, produces energy, and saves money as other fuels are replaced partially by scrap tires. This beneficial use has greatly increased in the last decade.

Tires produce the same amount of energy as oil and 25% more energy than coal. The oil equivalency of a passenger tire is 7 gallons and the heat content of shredded tires is 10 to

16% higher than that of coal. Tires have a high heating value—each pound of scrap tire rubber is equivalent to 15,000 BTUs of energy.

[Learn more about tire derived fuel \(TDF\).](#)

17. Why do I have to pay tire disposal fees? What is the money used for?

Many, but not all, states collect tire fees. In states where there are no tire fees, tire dealers, junk yards, etc. may charge customers for disposal (or may include the cost in the price of the tires purchased). In most states, the fees collected are dedicated to tire recycling and scrap tire cleanup, however, some states may use these funds for scrap tire management and market development. Other states use a portion of tire fees to fund other state projects.

[Learn more about tire fees.](#)

18. Does EPA certify tire recyclers?

States are responsible for permitting tire recyclers. Most transporters of scrap tires and storage facilities must be permitted by the states. Most states have requirements for those who are either transporting or storing scrap tires. In most cases, transporters are required by states to maintain records using a manifest system. EPA's report, [State Scrap Tire Programs – A Quick Reference Guide \(PDF\)](#) (53 pp, 262K, [About PDF](#)), provides a summary of permitting and recordkeeping requirements.

[Learn more about state tire laws.](#)

19. Does EPA certify products with recycled tire content?

EPA does not certify products made with recycled tire content. Consult independent, non-profit organizations such as [Green Seal](#) [\[EXIT Disclaimer\]](#) who certify and/or recommend products that cause less toxic pollution and waste, conserve resources and habitats, and minimize global warming and ozone depletion. Green Seal provides objective and unbiased information to direct the purchaser to environmentally responsible products and services.

The EPA has developed Comprehensive Procurement Guidelines for [designated products](#), with accompanying recycled-content recommendations. EPA's [Environmentally Preferable Purchasing \(EPP\) Web site](#) includes an [online searchable database](#) of environmental information for environmentally preferable products including tires and products made from recycled tires.

EPA has no financial interest in the products that it mentions, nor in any manufacturer or company.

20. Is there a risk to human health from tire piles?

Disease carrying pests such rodents can inhabit tire piles. Mosquitoes can also breed in the stagnant water that collects inside tires. Several varieties of mosquitoes can carry deadly diseases, including encephalitis and dengue fever.

[Tire fires](#) also release thick black smoke and air pollutants, and ground and surface water pollution that can be harmful to human health and the environment.

21. What products are made from tires?

Numerous products can be made with scrap tires. Scrap tires may be cut, punched, and stamped into various rubber products after removal of the steel bead. Products include floor mats, belts, gaskets, shoe soles, dock bumpers, seals, muffler hangers, shims, and washers.

Whole tires also have uses as highway crash barriers and for boat bumpers on marine docks.

Shredded tires may be used in many different types of applications.

The 3 primary scrap tire markets are:

- [Tire-derived fuel](#)
- [Civil engineering applications](#)
- [Ground rubber applications/rubberized asphalt](#)

[Learn more about innovative uses for scrap tires.](#)

22. What can you tell me about pyrolysis?

Pyrolysis is a process in which tires can be subjected to high heat, under controlled conditions, resulting in steel, oil, and carbon black. Although it has been shown repeatedly to be scientifically possible, economically and practically it has not proven to be a viable process. High capital investment and operating costs typically inhibit [tire pyrolysis](#) from being made commercially available.

ATTACHMENT II ENVIRONMENTAL STUDIES

Listed in order as appears on EPA website, including selected information. The selected information is limited in scope and is not intended as a substitute or comprehensive summary of each document. A copy of these documents may be downloaded from the EPA website or obtained from SHWB upon request.

1. Humphrey, Dana and Swett, Michael, Department of Civil and Environmental Engineering, University of Maine. "Literature Review of the Water Quality Effects of Tire Derived Aggregate and Rubber Modified Asphalt Pavement." November 29, 2006
 - a. Comprehensive summary of other studies.
 - b. Leachate does have a limited effect on drinking water quality and freshwater toxicity.
 - c. Undiluted leachate below the water table will result in toxic effects; however, dilution will reduce the effects to negligible levels.

2. Liu, Helen, et. al., Chelsea Center for Recycling and Economic Development, University of Massachusetts. "Environmental Impacts of Recycled Rubber in Light Fill Applications." August 1998.
 - a. Cites other literature which studies use below the groundwater table. It indicates increased iron up to two orders of magnitude higher than the secondary drinking water standard for iron, but does not appear to migrate. Manganese concentrations increase and do migrate with groundwater flow. Zinc concentrations increase, but remain below drinking water standards. Recommends that tire chips are only used where increased levels of iron and manganese are acceptable.
 - b. While data consistently shows the presence of iron, iron is not an ingredient in rubber products. The presence of iron indicates that steel belts and beads were not thoroughly removed during tire recycling operations.

3. Humphrey, Dana and Katz, Lynn. "Field Study of Water Quality Effects of Tire Shreds Placed Below the Water Table." 2001.
 - a. The four-year study consisted of three sites, with 1.4 tons of tire shreds buried below the water table. Groundwater samples were analyzed for metals, VOCs, and SVOCs.
 - b. Iron, manganese, and zinc were identified at levels exceeding secondary drinking water standards and background levels.
 - c. VOCs (1,1-dichloroethane, 4-methyl-2-pentanone, acetone, benzene, chloroethane, cis-1,2-dichloroethene) and SVOCs (aniline, phenol, cresol, benzothiazole, and 2(3H)-benzothiazolone) concentrations within the shredded fill area were identified at higher concentrations than background.
 - d. Concentrations decrease in samples collected downgradient from the fill areas. The study concludes a negligible effect on off-site water quality.

4. Engstrom, Glenn and Lamb, Rich. Using Shredded Waste Tires as a Lightweight Fill Material for Road Subgrades. Minnesota Department of Transportation; Report Number 94-10. April 1994.

- a. The long-term environmental impacts of using shredded tires as fill material is unknown.
- b. Metals are leached at higher concentrations under more acidic conditions. Barium, cadmium, chromium, lead, selenium, and zinc are constituents of concern. PAHs are leached at higher conditions under basic conditions.
- c. Drinking water recommended allowable limits (RALs) may be exceeded under "worst-case" conditions for barium, cadmium, chromium, lead, selenium, zinc, and certain PAHs.
- d. Asphalt samples also leach metals exceeding RALs in all pH solutions.
- e. Concern over the use of shredded tires below the water table or in contact with groundwater.

5. Evaluation of Health Effects of Recycled Waste Tires in Playground and Track Products. California Integrated Waste Management Board. January 2007.

- a. Toxicity due to ingestion based on existing literature.
The study calculated the likelihood for noncancer effects using a one-time ingestion of ten (10) grams of tire shreds by a typical three-year-old, and highest published levels of chemicals released by recycled tires. Zinc exceeded its health-based screening levels. Seven of the chemicals leaching from tire shreds were carcinogens, yielding a 1.2×10^{-7} increased cancer risk for one-time ingestion. The authors considered it unlikely that a one-time ingestion of tire shreds would produce adverse health effects.
- b. Toxicity due to ingestion based on gastric digestion simulation.
The study included a gastric digestion experiment for 22 chemicals and compared the levels of released chemicals to health-based screening values, assuming a young child ingested 10 grams of tire shreds. All exposures were at or below screening values for noncancer health effects. If the released chemicals were ingested as a one-time event and averaged over a lifetime, the cancer risk is 3.7×10^{-8} . The authors concluded that the cancer risk is acceptable.
- c. Evaluation of Toxicity Due to Chronic Hand-To-Surface-To-Mouth Activity.
The study used wipe sampling to evaluate playground surfaces. Ten metals and six PAHs were identified, with zinc, chrysene, fluoranthene, phenanthrene, and pyrene at least three times background. A total increased cancer risk of 2.9×10^{-6} was calculated from chronic ingestion of chrysene via hand to surface to mouth activity on rubberized playground surfaces.
- d. Evaluating the Potential for Damage to the Local Environment and Ecology
Concentrated leachate produced in the laboratory was toxic in 19/31 studies to a variety of organisms, such as bacteria, algae, fish, frogs, and plants. However, the study indicates that it is unlikely that the use of shredded tires in outdoor applications will result in leaching of high enough concentrations to produce such effects. The authors concluded that "considering all the data, it seems doubtful that recycled tire rubber in outdoor applications such as playground surfaces releases high enough levels of chemicals to cause toxicity to animals and plants living in the vicinity."
- e. Potential Injury from Falls on Playground Surfaces Made of Recycled Tires
The study identified a 69% failure rate for rubberized California playground surfaces using impact attenuation standards. Site conditions (such as temperature changes throughout the day), contractor installation practices, and post-construction certifications can affect the safety associated with this method.

**ATTACHMENT III
RETAIL INFORMATION**



DuPont™ Garden Products



DuPont™ Garden Products Home Products Weed Control Fabrics

General purpose Landscape Fabric Landscape PLUS Advanced Weed Defense Fabric Ready Ring™ Landscape MAX Maximum Weed Defense Fabric

Landscape PRO Professional Grade Landscape Fabric Seed Germination Blanket

Deer Netting Bird Netting Burlap

DuPont™ Signature Premium Rubber Mulch

Save precious time, money, and energy. How? With mulch that's guaranteed for 15 years.

Helps eliminate the need for annual mulching. Colorfast for lasting beauty and guaranteed for 15 years. To complement your landscaping, choose between earth tone and redwood. Helps control weeds. Requires half the depth needed for traditional wood mulch. Perfect for playgrounds and under play sets. Meets/exceeds American Society for Testing and Materials (ASTM) standards for safe playground surface use. Manufactured from 100% Recycled Rubber Product.

DuPont™ Signature Premium Rubber Mulch takes on the appearance of shredded natural wood. When used with DuPont™ Garden Products Weed Control Fabric and Anchor Pins it provides superior weed control and helps save you money in the long run over traditional mulches.

Premium Rubber Mulch is virtually maintenance-free. Use it this year and you'll have more time and money to spend on projects you really enjoy for years to come.

Full Guarantee



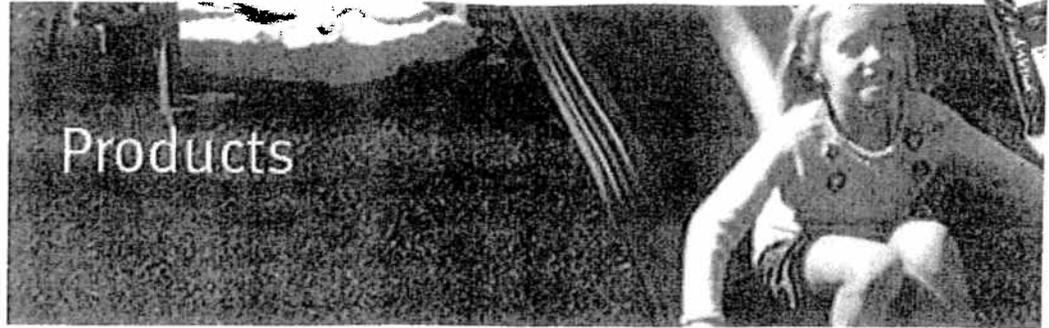
Make your playground safe. Use DuPont™ Garden Products Long-Lasting Mulch.

Play it safe. Help protect your kids against those bumps, scrapes and falls. The product is non-toxic, and when used at a depth of 6 inches, there's no safer playground surface.



The miracles of science™

DuPont™ Garden Products



DuPont™ Garden
Products Home
Products

Weed Control Fabrics

General purpose
Landscape Fabric

Landscape PLUS
Advanced Weed
Defense Fabric

Ready Ring™

Landscape MAX
Maximum Weed
Defense Fabric

Landscape PRO
Professional Grade
Landscape Fabric

Seed Germination
Blanket

Deer Netting

Bird Netting

Burlap

Frost Protection
Products

Landscape Anchor
Pins

Biodegradable Stakes

Signature Premium
Rubber Mulch

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Customer Care

What's New

Where to Buy

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DuPont™ Signature Premium Rubber Mulch Full Guarantee

FULL GUARANTEE

If for any reason you are not satisfied with this product, DuPont™ Signature Premium Rubber Mulch, for a period of 15 years after purchase, Greenscapes will issue you a full refund for the purchase price of the product provided you submit a copy of the dated sales receipt, a sample of the product and a brief written description of the problem. This refund is the sole and exclusive remedy provided under this Guarantee. Any additional incurred costs, such as labor for removal of original product, installation of replacement product and the cost of incidental or other materials or expenses are not provided under this Guarantee. For additional Guarantee information, please call toll-free 1-800-448-9835.

DuPont™ Signature Premium Rubber Mulch is Manufactured and Distributed by Greenscapes Home and Garden Products, Inc. In case of questions, problems or emergencies, please contact Greenscapes Home and Garden Products, Inc. at 1-800-448-9835, P.O. Box 1156, Chatsworth, GA 30701.



MATERIAL SAFETY DATA SHEET

9/24/05 as of 9/24/05
 NATIONAL SALES AND SUPPLY
 EMERGENCY TELEPHONE: (215) 639-6767

550 State Rd Suite 100
 EVENINGS/WEEKENDS: (215) 639-6767

PAGE 1

SECTION 1: IDENTIFICATION OF PRODUCT

PRODUCT NAME: RUBBERIZED MULCH
 PRODUCT NUMBER: VARIUOS
 LAST REV. DATE: 9/24/05

SECTION 2: HAZARDOUS INGREDIENTS

INGREDIENT	CAS #	% WEIGHT	DSHA PEL	(ACGIH TLV)
VULCANIZED RUBBER COMPOUND		98%	N/A	N/A
ORGANIC PIGMENT		1-2%	0.5MG/M ³	0.5

PERSONAL PROTECTION HMIS
 NA=NOT AVAILABLE ND=NO DATA

SECTION 3: PHYSICAL DATA

BOILING RANGE: N/A
 EVAPORATION RATE: N/A
 WEIGHT PER GALLON:
 VAPOR DENSITY: N/A
 VOLATILE BY WEIGHT: None
 VOLATILE BY VOLUME: None
 SPECIFIC GRAVITY: 0.95 to 1.40
 VOC: None
 PHOTOCHEMICAL REACTIVITY:
 APPEARANCE: Shredded rubber (various rubber)
 ODOR: Slight smell of vulcanized rubber
 SOLUBILITY IN WATER: Insoluble

SECTION 4: FIRE AND EXPLOSION HAZARD DATA

FLAMMABILITY CLASSIFICATION

OSHA:

FLASH POINT: Ignition temperature of dust cloud (approx. 320°C (608°F))
 LOWER EXPLOSIVE LIMIT (LEL): 0.25 oz/cu.ft.*
 UPPER EXPLOSIVE LIMIT (UEL): N/A
 EXTINGUISHING MEDIA: Water, foam, dry powder (do not use high pressure water)

UNUSUAL FIRE AND EXPLOSION HAZARDS: Dust may be explosive if mixed with air in critical proportions and in the presence of an ignition source. The hazard is similar to that of many organic solids.



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Bensalem, PA 19020

SPECIAL FIRE-FIGHTING PROCEDURES: Noxious gases may be formed under fire conditions. Wear NIOSH approved self-contained breathing apparatus.

* Estimates based on data for 200 mesh synthetic and crude hard rubber dust; Information contained in the NFPA Fire Protection Handbook

SECTION 5: HEALTH HAZARD DATA

PRIMARY ROUTE(S) OF ENTRY: Inhalation.

SIGNS AND SYMPTOMS OF OVEREXPOSURE: Itching of skin, irritation of mucous membranes, sneezing and coughing, irritation of eyes.

CARCINOGENICITY: Rubber is not listed as a carcinogen.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY OVEREXPOSURE: Not known; however, could potentially aggravate allergies due to dust exposure/inhalation.

EMEGENCY AND FIRST AID PROCEDURES: Normal washing of skin with soap and water. Ordinary means of personal hygiene are adequate.

SECTION 6: REACTIVITY DATA

STABILITY: Yes.

CONDITIONS TO AVOID: Conditions that will cause burning.

INCOMPATIBILITY (MATERIALS TO AVOID): Avoid strong oxidizing agents.

HAZARDOUS DECOMPOSITION OR BY PRODUCTS: Thermal decomposition may produce carbon monoxide, carbon dioxide, zinc oxide fume-dust, sulfur dioxide, liquid and gaseous hydrocarbons.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 7: SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Sweep or vacuum into disposal containers.

WASTE DISPOSAL METHOD: Product not defined as hazardous waste. Dispose of in accordance with federal, state and local regulations.



MATERIAL SAFETY DATA SHEET

9/24/05 as of 9/24/05

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Bensalem, PA 19020

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SECTION 8: SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION:	Use any dust and mist respirator for up to 10mg/m ³ .
VENTILATION:	Yes.
LOCAL EXHAUST:	Yes if dusty conditions occur.
MECHANICAL:	(General) Dust collectors and exhaust fans.
PROTECTIVE GLOVES:	Recommended.
EYE PROTECTION:	Use safety goggles to prevent dust entry.
OTHER PROTECTIVE CLOTHING OR EQUIPMENT:	Enough fresh air should flow past the user to prevent exposure to airborne fibers and particles.
WORK/HYGIENIC PRACTICES:	Good personal hygiene, frequent washing with soap and water or exposed areas, remove and clean soiled clothing.

SECTION 9: SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

Do not store near flame or ignition source. Do not store hot material in tubs or containers where spontaneous combustion could occur.

OTHER PRECAUTIONS: If material burns, oils will be released. These must be disposed of in accordance with federal, state and local regulations.

SECTION 10: REGULATORY INFORMATION

TOXIC SUBSTANCES CONTROL ACT (TSCA) STATUS:	Ingredients are on the TSCA list.
SARA SECTION 312 HAZARD CATEGORIES:	N/A
SARA SECTION 313 STATUS:	N/A
D.O.T. HAZARD CLASS:	N/A

The information contained herein is based on data available to us and is believed to be correct. However, National Sales and Supply makes no warranty, express or implied. Consult National Sales and Supply for further information.



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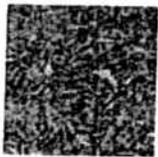
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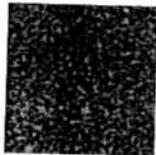
[Playground Product](#)



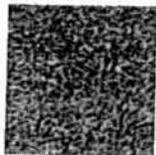
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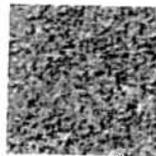
Multi-colored



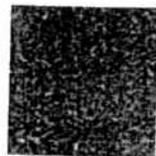
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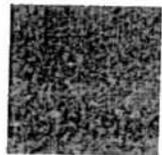
Blue



Green



Brown

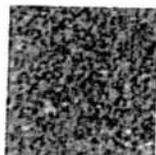


Red



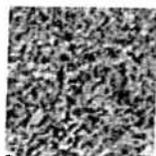
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Mini-Nuggets

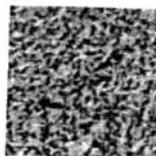


Red

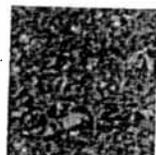
Mini-Nuggets



Green Nuggets



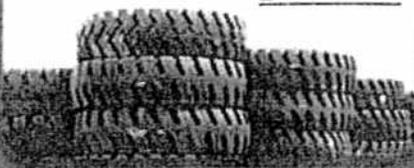
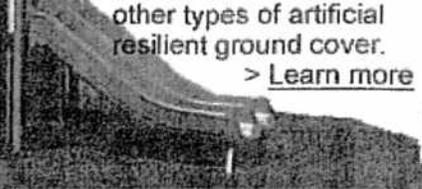
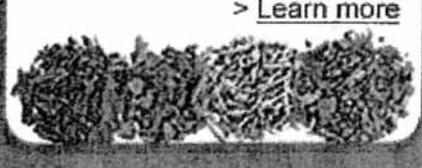
Blue Nuggets



Brown Nuggets

Note: All monitors are different, so the color you see here may not be completely accurate. To be sure you get what you want, please order a sample.



<p>Quality Products Made From Recycled Tires We use 100% recycled rubber from automotive tires, organically dyed, making our products nontoxic for children, pets, and our environment > Learn more</p> 	<p>Rubber Mulch - Shredded Cost effective, rubber mulch resists mold, mildew, and insects. Choose shredded or nugget sizes in a wide variety of colors. > Learn more</p> 	<p>Rubber Mulch Nuggets Our nontoxic, metal-free, recycled tire material provides quality protection for children. It's ADA accessible and remains cleaner than other types of artificial resilient ground cover. > Learn more</p> 
<p>Rubber Tiles, Pavers, Curbs, & Stepping Stones These Majestic products are "one-pour" rubber surfaces that bring another level of safety to any flowerbed, garden, public area, or playground. > Learn more</p> 	<p>Crumb Rubber Is Safe and Cost Effective Crumb Rubber is recycled rubber that has been reduced to very small particles. Majestic Crumb Rubber is ideal for athletic fields, golf paths, playgrounds, and other uses. > Learn more</p> 	<p>Colorfast Rubber Mulch Warranty Colors can last 10-15 years without fading, the product's coating eliminates rubber dust, and material is antifungal, antibacterial, and does not absorb moisture. > Learn more</p> 

Majestic Rubber Mulch

Reuse and Recycle Rubber Products for Playground Safety and Landscape Beauty

Majestic™ Rubber Mulch is a premier supplier of safe, recycled rubber products for numerous play and gardening applications. For playground safety we manufacture rubber mulch, rubber tiles, rubber mats, flexible rubber curbs, and rubber walkways. For commercial and residential landscaping we manufacture decorative colored rubber mulch, rubber timbers, rubber curbs, rubber tree rings, rubber pavers, rubber paving stones, and rubber ground fill—all with a 12-year color guarantee.

The process used to create rubber mulch from old tires removes all metal and toxic elements and adds UV protection so the mulch looks good and remains clean year after year. It is so well designed that professionals find it difficult to tell our rubber mulch apart from organic root mulch in its standard natural colors. Majestic Rubber Mulch also offers decorative designer-like colors as well!

Majestic shredded rubber mulch and rubber nuggets resist the mold and mildew that commonly attack plants and structures. Our shredded rubber mulch and rubber nuggets are attractive yet create a hostile environment for termites, ants, and other bugs and insects. The health and safety performance as well as ADA* accessibility of Majestic Rubber Mulch playground and landscape products make them ideal for schools, daycares, parks, homes, offices, and other institutions.

*The Americans with Disabilities Act sets accessibility standards for these materials.



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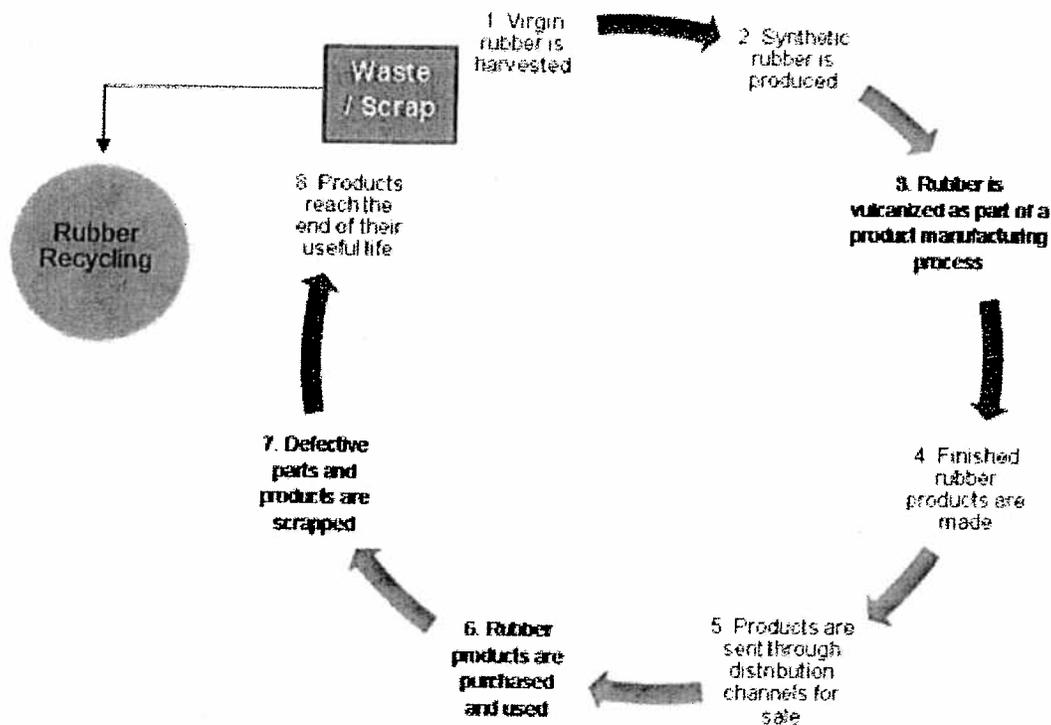
Quality Products Made From Recycled Tires

How tires are recycled

Tires are created through a process known as vulcanization, which gives them a springy, flexible nature as well as makes them more durable. Vulcanization also makes a tire difficult to melt for reuse, so they are typically broken down by powerful machines.

First the tires are shredded into strips using rugged machines. The shredded material is then placed in grinding machines that use rotors to further shred the material and remove the steel fibers from the tire. Powerful magnets are also used to further draw metal from the rubber.

Once the bulk of the steel is removed, the strips are placed into granulators. Depending on the product requirements, rubber from the shredded tires can be milled into assorted sizes. The final step has the milled rubber chemically sealed for health safety and durability.



Recycled Rubber (RR) Beginnings

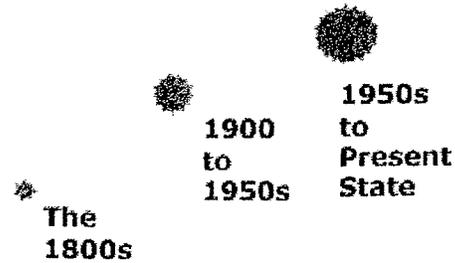
After WWI, large-scale tire recycling was observed largely due to shortages of natural rubber coupled with high prices. Key milestones in the history of recycled rubber include the establishment of The Environmental Protection Agency (EPA) in 1970, and the rubber recycling industry's upheaval in the mid-1990s. In 2000, new rubber recycling rules were set by the EPA, and the industry changed and became more diverse.

The future of TDF is in question with concerns about the environment and the recent ruling by the federal courts that favor the environmentalists.

Rubber Recycling Chronology

The 1800s

Rubber recycling dates back to the 1800s, the time when industrial rubber manufacturing began. A machine called a masticator, or pickle, invented by Thomas Hancock around 1820, ground up rubber scraps into shreds that could then be mashed into blocks and reused. This type of rubber recycling was very basic and easy, but short-lived. In 1843, Charles Goodyear invented vulcanization, a process of weatherproofing rubber by linking all the molecules in a rubber product into one big molecule to prevent separation. Goodyear's process received a patent on June 24, 1844.



The 1900s to 1950s

In the 1900s, since vulcanization links the molecules, it was difficult to separate the molecules again for recycling, meaning the product could not be re-melted. Vulcanized rubber could still be shredded and ground, but it had to be mixed with natural rubber for reuse. A shortage of natural rubber caused by the need for tires during World War II led to the building of synthetic rubber plants around the world in 1945.

The 1950s to Present State

In the 1960s, cheap oil imports and an increased use of synthetic rubber brought down manufacturing costs, and the tire and rubber industry's recycled rubber content dropped to 20%. Use of synthetic rubber surpassed that of natural rubber for the first time. The 1960s also brought about steel-belted radial tires, which made recycling even more difficult. The steel would now have to be removed after slicing and grinding. A national wave of Tire-Derived Fuel (TDF) development occurred in the mid 1980s. TDF is not the recycling of tires, but it eliminates tires from landfill buildup and provides a fuel for utilities. In 1990, markets began in TDF, with 17% of used tires used for that purpose, as compared to 78% in 2001. In 2003, 80.4% was used for TDF.



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Frequently Asked Questions

How is it packaged?

Majestic Rubber Mulch is packaged a few different ways. Please contact us for packaging options.

Does it smell?

Once opened, Majestic Rubber Mulch has an odor initially. However, after a few days, the smell will dissipate.

Will Majestic Rubber Mulch freeze?

No. Majestic Rubber Mulch is hydrophobic--it does not absorb water--so it will not freeze.

Will it decompose?

Majestic Rubber Mulch will not decompose for over 200 years. When fading begins after at least ten years, you can either top-dress it with fresh Majestic Rubber Mulch or till it into the soil. Majestic Rubber Mulch is safe to till into the soil because it is nontoxic and acts as an aerator to help keep the soil from compacting. Similar rubber products such as crumb rubber are being used for the same purpose in athletic fields all across the country. You can also rake up your faded mulch to use as landfill.

What kind of insulation does it provide?

Majestic Rubber Mulch keeps soil 10° cooler in summer and 10° warmer in winter.

How much does it cover?

Since Majestic Rubber Mulch can be used for many applications, please refer to our Mulch Calculator to give you an accurate estimate on how much you will need.

Can I use Majestic Rubber Mulch with horses?

Majestic Rubber Mulch is great for horse arenas and stalls. It is easy on horses' joints when they step on it, and it is dust free. Many of our customers mix in the rubber mulch with sand and dirt. For horse stalls, we recommend spreading the mulch at a ½ inch depth. We offer rubber mulch without a colored coating that is more cost-efficient for such use.

Is Majestic Rubber Mulch dirty?

No. Majestic landscape and playground mulches are colored using a licensed process, which seals the rubber after the desired color is applied. You can even play in Majestic Rubber Mulch in the rain.

Will Majestic Rubber Mulch stain clothes?

No. Unlike organic materials, Majestic Rubber Mulch will not stain clothes.

How do I install it?

The most ideal way to install rubber mulch is over a weed fabric. We recommend using a weed fabric and not a plastic material because plastic is not permeable. When installing rubber mulch over a weed fabric, you will never have any weed problems, and you won't have to worry about previous mulch debris mixing with it. Majestic Rubber Mulch can be installed over your previous wood mulch, but make sure the wood mulch has had time to decay and become compacted.

Is Majestic Rubber Mulch flammable?

Majestic Rubber Mulch is not flammable.

Tire chips were tested in 1995 in accordance with the Federal Hazardous Substance Act (16 CFR 1500.44) to determine whether this material would be considered "flammable." (A material is considered flammable if it ignites and burns with a self-sustained flame at a rate greater than 0.1 inches per second along its major axis.) Per these test results, scrap tire material is considered nonflammable.

What if a child swallows a rubber nugget?

In 1994 the Maryland Environmental Services (MES) put this question to a series of tests. At the MES request, a testing laboratory subjected ¾-inch pieces of tire chips to hydrochloric acid (stomach acid). "Visual examination of insoluble residue appeared to indicate only fibrous reinforcing strands were dissolved by the hydrochloric acid. The tire rubber did not appear to be affected in any way; i.e., chalking, cracking, fracturing, etc." (PSI Report No. 486-40013-001)

What does this mean?

If a piece of rubber is swallowed, it should not cause any acute or chronic problems. Short-term issues, such as an upset stomach, will be a function of the amount of rubber swallowed. As to the fate of the rubber chips swallowed, they are eventually evacuated from the body, just like any other indigestible material.

Has Majestic Rubber Mulch been certified by any outside agencies?

Majestic Playground Mulch meets all of the criteria established by the International Playground Equipment Manufacturers Association (IPEMA) and complies with ASTM F1292-04, Standard Specification for Impact Attenuation Under and Around Playground Equipment, and ASTM F1951, Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment. Majestic Premium Playground Mulch is also ADA compliant.

In the interest of playground safety, IPEMA provides a Third Party Certification Service whereby a designated independent laboratory, Detroit Testing Laboratory, Inc., validates a surfacing manufacturer's certification of conformance to ASTM F1292, Standard Specification for Impact Attenuation Under and Around Playground Equipment. Regardless whether you settle on our product or not, you should not accept any product that does not bear this certification. Check the IPEMA website to confirm product validation, as well as tested critical height. The use of the IPEMA Certification Seal signifies that Majestic Rubber Mulch has received written validation from the independent laboratory that the product associated with the use of the seal conforms to the requirements of ASTM F1292-04.

Have there been any studies about the toxicity of rubber mulch?

We are aware of five studies:

1. A study by the University of Maine's Department of Civil Engineering on water quality of tire leachate below the ground water table showed that, if the groundwater is near neutral (not too acidic or alkaline), tire shreds have only a small impact on groundwater quality.
2. Five-Year Study Of The Water Quality Effects Of Tire Shreds Placed Above The Water Table
3. Comparative Study of the Toxicity of Chipped Tires and Wood Chips Leachate
4. The Chelsea Center's Technical Report on Environmental Impacts of Rubber In Light Fill Applications. This study concludes that recycled rubber derived from scrap tires is a safe, recyclable material.
5. The Minnesota Department of Transportation (DOT), Using Shredded Tires as Lightweight Fill Material for Road Subgrades

What does the EPA have to say about rubber mulch?

1. Ground rubber applications
2. Recycled rubber products in landscaping applications
3. "Greenscaping" your lawn and garden
4. On golf courses
5. Frequently Asked Questions

Does the use of rubber mulch reduce the need for herbicides?

We were happy to learn that it does in this article from [Landscape Online](#).

Is play important?

IPEMA recently began an initiative to promote the benefits of children's play and playgrounds and to provide information and resources to help us all improve the quality and quantity of children's play and playgrounds. A website, www.voiceofplay.com, is sponsored by the International Play Equipment Manufacturers (IPEMA) and is for parents, kids, community groups, school principals, boards, teachers and administrators; parks and recreation professionals; playground designers, and equipment manufacturers--along with everyone who cares about kids and play! Some highlights of this site include information about physical, social, emotional, and cognitive benefits of play; playground certification and standards; a resource kit for parents; and an area to pose questions to our play experts.

Has any research been done using rubber mulch on athletic fields?

Yes, at Michigan State.

Has any research been done using rubber mulch on golf courses?

Yes, these are the results of a [Canadian study](#) and research at [Southern Illinois University](#) – Carbondale. The [University of Florida](#) has also started doing research on using rubber mulch on athletic fields and golf courses. This article on [Recycled rubber as a drainage layer medium under greens](#) may also be of interest.

Environmentally, what is the best management strategy for scrap rubber tires?

The [Ohio Department of Natural Resources](#) has looked at this question carefully.



DuPont(tm) Garden Products(tm) Long-Lasting Mulch
(DU008550) Revised 6-FEB-2006 Printed 6-FEB-2006
*** WORK COPY ***

CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Tradenames and Synonyms

DuPont(tm) Garden Products(tm) Long-Lasting Mulch-Earthtone
DuPont(tm) Garden Products(tm) Long-Lasting Mulch-Redwood

Company Identification

MANUFACTURER/DISTRIBUTOR

DuPont
1007 Market Street
Wilmington, DE 19898

PHONE NUMBERS

Product Information : 1-800-441-7515 (outside the U.S.
302-774-1000)
Transport Emergency : CHEMTREC 1-800-424-9300(outside U.S.
703-527-3887)
Medical Emergency : 1-800-441-3637 (outside the U.S.
302-774-1000)

COMPOSITION/INFORMATION ON INGREDIENTS

Components

Material	CAS Number	%
Recycled Cured Rubber with Colorant and Sealer		100

Components (Remarks)

The specific identity is withheld as a trade secret.

HAZARDS IDENTIFICATION

Potential Health Effects

This product is not expected to present a health or safety hazard under normal conditions of use.

Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

FIRST AID MEASURES

First Aid

INHALATION

If large amounts of dust are inhaled, or if exposed to fumes from overheating or combustion, remove to fresh air. Consult a physician if breathing is difficult or if symptoms persist.

SKIN CONTACT

The compound is not likely to be hazardous by skin contact but cleansing the skin after use is advisable.

EYE CONTACT

In case of contact with dust or particles, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician if irritation persists.

INGESTION

Ingestion is not an expected route of exposure during normal use of the product. If ingested, consult a physician immediately.

FIRE FIGHTING MEASURES

Flammable Properties

Flash Point : No Data Available
Autoignition : No Data Available

Combustion may produce hazardous gases or vapors including carbon monoxide, polycyclic aromatic hydrocarbons (PAHs), benzene, styrene, phenols and butadiene.

Extinguishing Media

Water Spray, Foam, Dry Chemical, CO2.

Fire Fighting Instructions

Keep personnel removed and upwind of fire. Wear self-contained breathing apparatus. Wear full protective equipment.

ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Spill Clean Up

Shovel or sweep up.

HANDLING AND STORAGE

Storage

Store away from open flame.

EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines

Exposure Limits

DuPont (tm) Garden Products (tm) Long-Lasting Mulch
PEL (OSHA) : None Established
TLV (ACGIH) : None Established

PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Form : Solid.
Color : Brown, Red.
Odor : Characteristic.
Solubility in Water : Insoluble
Specific Gravity : Undetermined

STABILITY AND REACTIVITY

Chemical Stability

Stable at normal temperatures and storage conditions.

Incompatibility with Other Materials

Incompatible with strong oxidizers or acids, chlorine, ozone.

(STABILITY AND REACTIVITY - Continued)

Decomposition

Decomposition products from combustion are dependent on time, temperature and other variables. Hazardous gases or vapors may include: carbon monoxide, polycyclic aromatic hydrocarbons (PAHs), benzene, styrene, phenols and butadiene.

Polymerization

Polymerization will not occur.

TOXICOLOGICAL INFORMATION

Animal Data

Based on available data, DuPont (tm) Garden Products (tm) Long-Lasting Mulch is not a skin irritant or skin sensitizer and is expected to have very low toxicity by ingestion.

ECOLOGICAL INFORMATION

Ecotoxicological Information

96hr LC50 (fathead minnow): >100 mg/L
48hr EC50 (Daphnia magna): >100 mg/L
72hr EC50 (green alga): >100 mg/L

DISPOSAL CONSIDERATIONS

Waste Disposal

Treatment, storage, transportation, and disposal must be in accordance with applicable Federal, State/Provincial, and Local regulations. Do not burn.

REGULATORY INFORMATION

U.S. Federal Regulations

RCRA

Under RCRA, it is the responsibility of the product user to determine at the time of disposal whether a material containing the product or derived from the product should be classified as a hazardous waste (40 CFR 261.11).

(REGULATORY INFORMATION - Continued)

This product has been evaluated for RCRA toxicity characteristics by the Toxicity Characteristic Leaching Procedure (TCLP) and, if discarded in its purchased form, does not meet the criteria for the characteristic toxicity.

OTHER INFORMATION

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

Responsibility for MSDS : DuPont Landscape Systems Product Steward
Telephone : 800-448-9835

End of MSDS