

University of Missouri Extension

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Hot Wheels — Scrap Tire Recycling

John M. Amos

Engineering Specialist, University of Missouri-Rolla

Every year in the United States, 250 million automobile tires are discarded, presenting a serious disposal problem. Scrap tires take up large amounts of space and are difficult to destroy. The unsightly mounds of tires are flammable and release toxic fumes when burned.

Missouri requires that all tires going to a landfill be shredded, with the end-product no larger than 6-inch chips. If they are discarded in larger sections, scrap tires do not disappear when dumped in landfills, but instead trap air that causes them to slowly push their way to the surface.

This publication is intended to help Missourians comply with state regulations in reducing accumulations of scrap tires. Some potential uses for scrap tires, as well as some businesses that will accept old tires, are provided here.

Another publication of interest is *Scrap Tire News*, 133 Mountain Road, P.O. Box 714, Suffield, CT 06078, (203) 668-5422. This publication is a product and service exchange aimed at the scrap tire industry. Monthly newsletter covering the news and developments in the scrap tire processing industry.

Energy potential

Chipped scrap tires with varying levels of wire and fabric still contained in the chips have a very high British Thermal Unit (Btu) value compared to other common energy sources. The following table compares the potential of rubber products with other energy sources:

	Btu/lb.
coke	13.7
wood	4.375
bituminous coal	12.75
subbituminous coal	10.5
lignite coal	7.3
rubber derivative	16.0

Fuel for industrial and utility boilers

TDF (tire-derived fuel) requires users to have agreements on zoning, transmission access, construction and environmental applications from state and local authorities. Some utility companies that have tested or are burning scrap tires are:

- Illinois Power Company, Decatur, Illinois; Baldwin power facility
- Oxford Energy Company, Moapa, Nevada; Modesto, California
- Ohio Edison Company, Toronto Plant
- Uniroyal Goodrich, Eau Claire
- Wisconsin Power & Light Company, using cyclone-fired utility boiler
- Otter Tail Power Company, Big Stone City, South Dakota
- Monsanto Company, Wm. G. Krummrich Plant, Sauget, Illinois

Highway applications

Recycled rubber is used in asphalt overlays on highways. A reclaimed rubber modified asphalt mixture improves stability, durability, reflective crack reduction and oxidation resistance. All of this adds up to a mixture with an indicated service life outlasting our conventional mixes. Construction procedures are similar to typical lay-down operations.

Tire retreading

Tire retreading and remanufacturing offers one of the best opportunities to reduce the number of tires requiring disposal. Tire type determines the future life of a tire. Radial passenger tires, unlike the bias tire, are not easily retreaded. New radials require retreaders to retool to state-of-the-art equipment. Generally, low-cost passenger tire imports cannot be retreaded.

Table 1. Various potential uses for scrap tires.

Potential uses	Advantages	Disadvantages	Marketable product
Artificial reefs	Increases fish habitation; long life; ease of configuration.	Costly to install; may move.	Reefs.
Breakwaters	Perform well; durable; low cost.	Limited number of tires used	Breakwater.
Construction	Perform well; low cost.	Limited number of tires	Retaining walls; erosion control; crash attenuation; structural fill material.
Crumb rubber	Marketable commodity; reclaims raw material; marketable applications.	High cost.	Crumb rubber.
Rubberized asphalt	Longer wear; noise buffer.	Mixed test results; requires special equipment; not proven economical.	Asphalt.
Sealants	Proven effective.	Limited number of tires used.	Roof/road sealant.
Railroad crossings	Proven effective; reduces supply.	Limited number of tires used.	Railroad crossings.
Sport surfaces	Better surface; lessens impact.	Limited number of tires used.	Running tracks; playgrounds.
Stampings	Proven effective.	Limited number of tires used; not economical; fragmented market.	Dock bumpers; farm machinery rollers; pipe rollers.
Soil additives	Improves soil quality; improves air circulation.	Limited number of tires used; fixed sales for compost.	Tire chips.
Sheet goods	Proven effective.	Limited uses; limited number of tires used.	Floor mats, carpet pads; mud guards.
Molded products	Wide variety of uses.	Saturated market.	Truck bed liners; pots, buckets, etc.
Tire retreading	Historically proven; reduction of supply.	Declining market.	Retreaded tires.

Dedicated whole tire boilers	Completely disposes tire; produces energy; appears environmentally clean.	Long pay-back period; community acceptance; new boiler construction; requires large stockpile for continuous use.	Energy.
Municipal Solid Waste/Waste to Energy (MSW/WTE)	Reduction of supply; compatible with existing fuels; can boost Btu content.	Limited use; tires may burn too hot; limited MSW/WTE facilities.	Energy.
Pulp/paper plants	Reduction of supply; compatible with existing fuels; can boost Btu content.	Limited use in Illinois; increases air emissions; required stockpiles.	Energy.
Utility boilers	Reduction of supply; compatible with existing fuels.	Requires stockpiles; increases air emissions.	Energy.
Cement kilns	Reduction of supply; compatible with existing fuels.	Requires clean TDF.	Energy.
Fluidized bed boilers	Reduction of supply; compatible with existing fuels.	Requires clean TDF; requires stockpiles; increases air emissions.	Energy.
Pyrolysis	Minimal environmental impacts anticipated.	Unproven markets; requires stockpiles.	Oil and combustible gas; carbon black.

Examples of companies involved in scrap tires (This is only a partial list and is not an endorsement.)

R&S Recycling, Inc., Schriever, Louisiana

Markets a complete line of tire pots containing 75 percent post-consumer recycled tire materials for industrial, agricultural and household use.

Lakin General Tire, Chicago, Illinois

Produces retread and remanufactured tires for Sears catalog sales. Under trade name TICOR, manufactures a wide variety of die-cut parts made from scrap tires such as tailpipe hangers, snowblower blades, conveyor rollers and cornhusking rollers.

University of Florida Building Construction Industry Advisory Committee

Conducting research on old tires in roofing materials. Project title is "A Study to Determine Ways to use Ground Rubber from Used Tires in Roofing Materials and Any Other Construction Products."

Products to Oil, Inc. (PTO), Springdale, Arkansas

- Pyrolysis of tires to oil and carbon black.

Durable Materials Company, 25 N. Pleasant Street, Norwalk, Ohio 44857

Offers rugged, economical culvert piping manufactured from steel and nylon-reinforced truck tire beads.

Ag Products Terminal Company, Clayton, Iowa

Uses a former silica sand mine for an underground tire recycling and storage plant.

High Tech Recycling Systems Corp., Portland, Oregon

Gasification system that recycles tires into oil, carbon black and various gases.

Energy Products of Idaho (EPI)

Developed pilot plant with a fluid bed design to efficiently convert tires into usable energy in a clean environmentally sound manner. EPI has obtained permits for two energy systems fired entirely on tires.

DOT Recycling Systems, Inc., Fort Wayne, Indiana

ITEC, Inc., 3602 Elida Road, Lima, Ohio 45807, 800-727-2029

Designed to reclaim tire materials for recycling operations. Produces a clean rubber product by separating the tire bead and removing the metal belting through a mechanical process, reclaiming rubber, metal belting and nylon materials from 1,500 tires for an 8-hour shift. Price for the base systems begins at \$560,000 turn-key installations. Operations and maintenance training and system warranty are included.

**Waste Company Generation, Technology Corp., Norwalk, Connecticut,
(203) 838-1023**

Distributor for the Daito-Sanshin antipollution incinerators for on-site tire disposal. The company offers an automatically programmed and controlled tire incinerator system that can meet all environmental rules and regulations without noxious fumes or smoke.

**North American Crumb, Inc., 1345 Monroe, NW, Grand Rapids, Michigan
49505, (616) 451-9799**

Process to grind scrap tires into crumb and powdered rubber using cryogenic technology.

**Edal International Sales Corp., P.O. Box 348, 7247 Lake Bluff Court,
Wilsonville, Oregon 97070, (503) 694-2655**

Industrial shredders, crushers, pulverizers and material handling equipment.

International Tire Mgt., Inc. (ITM), Rome, New York

Manufactures high-density tire baler that reduces total volume by approximately 80 percent.

Shredding scrap tires

For many uses of scrap tires, some shredding is required before they can be processed into marketable products. Capital costs for various types of equipment are listed in the table below. (Note: this is a representative sample of costs and output. It is not a complete list of all manufacturers and is not intended as an endorsement of any equipment listed here.)

Table 2. Shredding scrap tires.¹

Shredder type/manufacturer		Estimated Cost ²	System Configuration ³	Estimated Throughput ⁴ (tons/hour)	Chip size ⁵
Replaceable Cutter/	Columbus	\$500-525	Portable	12 to 13	RS
	McKinnon	\$435-460	Stationary	8 to 10 4 to 5	2 inches 1 inch
Triple/S Dynamics		\$550-575	Portable	12 to 13	RS
		\$400-425	Stationary	8 to 10 4 to 5	2 inches 1 inch
Rotary Shear/Eidal		\$375-400	Portable	10 to 12	RS
		\$290-315	Stationary	6 to 8 3 to 4	2 inches 1 inch
ERS		\$500-525	Portable	12 to 13	RS
		\$425-450	Stationary	8 to 10 3 to 4	2 inches 1 inch
Mac-Saturn		\$400-425	Portable	10 to 12	RS
		\$340-365	Stationary	6 to 8 3 to 4	2 inches 1 inch
Mitts & Merrill (Carthage)		\$375-400	Portable	8 to 10	RS
		\$250-275	Stationary	5 to 7 2-1/2 to 3	2 inches 1 inch
Shredding Systems		\$450-475	Portable	10 to 12	RS
		\$375-400	Stationary	6 to 8 3 to 4	2 inches 1 inch

¹Portable systems are self-contained with diesel generator; systems include conveyors, sizing device (typically a disc screen) and magnetic for 1 inch minus chip production; 1 inch minus chip throughputs are estimates based on limited experience.

²Costs are estimated and will vary for each application; costs do not include recent price increases that may have occurred.

³"Portable" assumes 1 trailer with diesel generator; "Stationary" assumes electric power is available on-site.

⁴Estimated throughput in tons/hour.

⁵RS = Rough Shred throughput, one pass through cutters; 2 inches = chip size of 2 inches or less; 1 inch = chip size of 1 inch or less.