

# Waste Education Series

Solid and Hazardous Waste Education Center



Cooperative Extension • University of Wisconsin-Extension

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## MATERIAL MANUFACTURING AND RECYCLING: TIRES

### Tire Industry Background

A waste tire is a whole tire that is no longer suitable for its original purpose because of wear, damage, or defect. Each year, nearly 240 million additional waste tires enter the waste stream, not including the 33.5 million tires that are retreaded. This represents 1 tire per person per year for every person living in the United States. These waste tires add to the current stockpiles which have been estimated to contain 2.5 to 3 billion tires.

The average automobile tire weighs about 20 pounds, which is equivalent to 100 tires per ton. Truck and bus tires are much larger, with only 20 tires per ton. Tires come in two very different designs, non-belted and steel-belted. Steel-belted radial tires have a lifespan that is 2 to 3 times greater than non-belted tires, creating fewer waste tires, but are very difficult to recycle. Non-belted tires, on the other hand, are fairly easy to recycle. They were reground and used as a feedstock by tire manufacturers until the late 1960s, when the availability of cheap oil and low cost, high performance synthetic rubber compounds gave rise to the radial tire. Today, non-belted tires represent only 10% of all used tires in the waste stream.

The passage of the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) has the potential to redefine market demand for waste tires. Section 1038 of ISTEA requires states to meet minimum utilization requirements for asphalt containing recycled rubber in federally-funded transportation projects. Those states not meeting the requirements will lose a portion of their federal highway funding. Utilization requirements begin at 5% in 1994, and increase to 10% in 1995, 15% in 1996, and 20% in 1997. A bill passed by the U.S. House of Representatives in 1993 eliminated all funding for implementation and enforcement of ISTEA for 1994. Thus, utilization requirements are in effect with no enforcement provisions. Future legislative efforts will likely impact this law in ways that cannot yet be determined.

### Tire Recycling

There are four primary categories of methods by which tires can be reused or recycled. These include uses for whole tires, uses for shredded tires, uses for crumb rubber, and pyrolysis.

#### Uses for Whole Tires

Retreading is a process of extending the life of a used tire, with new tread placed on the used tire casing. These tires are described as *used* tires rather than *waste* tires because the tires will be used for their original purpose after recapping. The average non-belted tire can be retreaded four to six times before the casing is no longer suitable. Steel-belted tires can only be retreaded two to three times, with the retreading process

being much more expensive than for non-belted tires. Airplane and truck tires are the most frequently retreaded tires.

Whole tires can also be used for artificial reef building, where tires are strung together, weighted down, and placed in desired locations below the surface of the water. Another marine use of whole tires is for breakwaters. Finally, whole tires can be used as bumpers on docks and boats, playground equipment, erosion control and construction applications, crash barriers, and sound barriers.

#### Uses for Shredded Tires

Primary shredding is the first major step for changing the shape and form of whole tires. Daily cover at landfills and fabricated products, such as athletic, industrial, blasting, and commercial mats, are the two major uses of primary shredded tires.

Secondary shredding, to produce smaller shreds, allows tires to be used in compost and as tire-derived fuel (TDF). In composting projects, tire chips can be used as a bulking agent to increase air flow. Shredded tires have also proven to be an excellent form of industrial fuel when used in fairly small percentages, typically 10 percent or less. TDF has more energy per weight than an equivalent amount of most types of coal. The use of TDF is becoming very popular in certain industries, especially the pulp and paper industry and public power utilities.

#### Uses for Crumb Rubber

Crumb rubber is generally defined as rubber small enough to be reused in molded or mixed products. Each year about 2.3 million tires are converted to crumb rubber. Its uses include molded rubber products such as wheel chocks, car stops and recycling containers; athletic surfaces; and rubberized asphalt.

#### Pyrolysis

One final way of dealing with waste tires is pyrolysis, a process used to break a material down into organic compounds with lower molecular weights. Pyrolysis relies on chemical and thermal processes to accomplish this result. The products of tire pyrolysis include a gas, generally used to fuel the process; oil, which usually requires blending or further refining to yield a marketable fuel oil; and a char or black. Typically, a ton of tires will yield 125 gallons of oil and 700 pounds of carbon black.

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◆ For more information, contact your County Extension Agent or SHWEC ◆

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