Tire Recycling

Tire Recycling

Figure 12.3 Tire reef prior to deployment in the Black Sea.

Figure 12.6 Poole Bay tire artificial reef tetrahedral module 1 year after deployment.

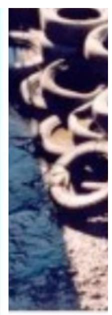


Figure 12.4 Red Sea tire reef with corals, off Eilat, Israel.

What is a Tire?

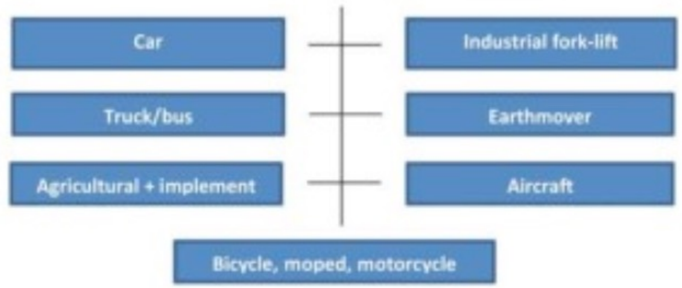


Figure 2.2 Tire types.

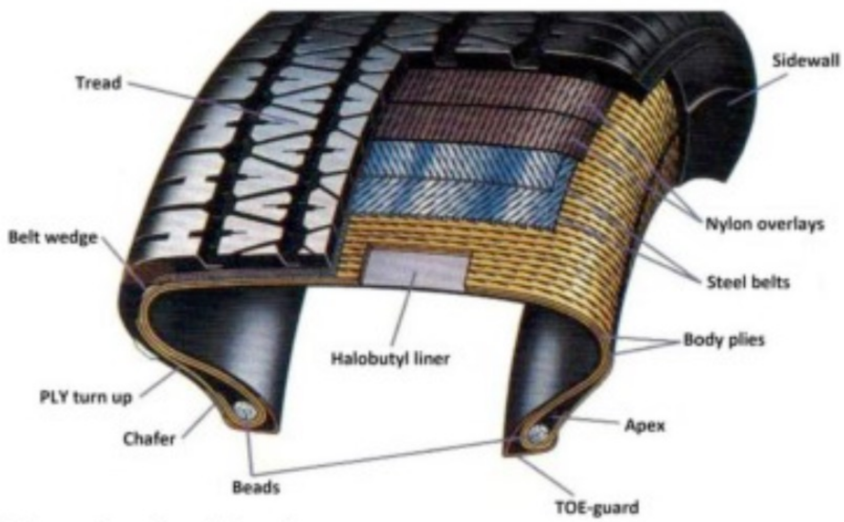


Figure 2.3 Cross-section of a typical car tire.

Table 2.1 What goes into a tire?

Materials	Proportions	
1. Natural and synthetic rubbers	± 40%–48%	Ratio of natural to synthetic rubber: ± 2–1 truck tires; ± 4–3 car tires
2. Carbon blacks and/or silica	± 22%–27%	A range of carbon blacks of varying sizes, structures, and characteristics are used in different parts of a tire
3. Reinforcing materials	± 5%–25%	
Metals (steel)	+ 15%–25%	In the beads, belts and castings of a truck tire
	+ 11%–13%	In castings and plies of a car tire
Textiles	+5%–10%	Textiles are a basic reinforcing material used in many tire types
4. Facilitators	± 8%–0%	Extender oils, waxes, and plasticizers aid processing; curing systems include sulfur, zinc oxide, stearic acid, and accelerating agents; antioxidants, antiozonants, etc., protect the compound; carbon black/silica increase mechnical properties; clay, whitings, etc., are fillers

Source: Courtesy ETRA, 16 Avenue de Tervueren, 1040 Brussels, Belgium.

More Tires Every Year

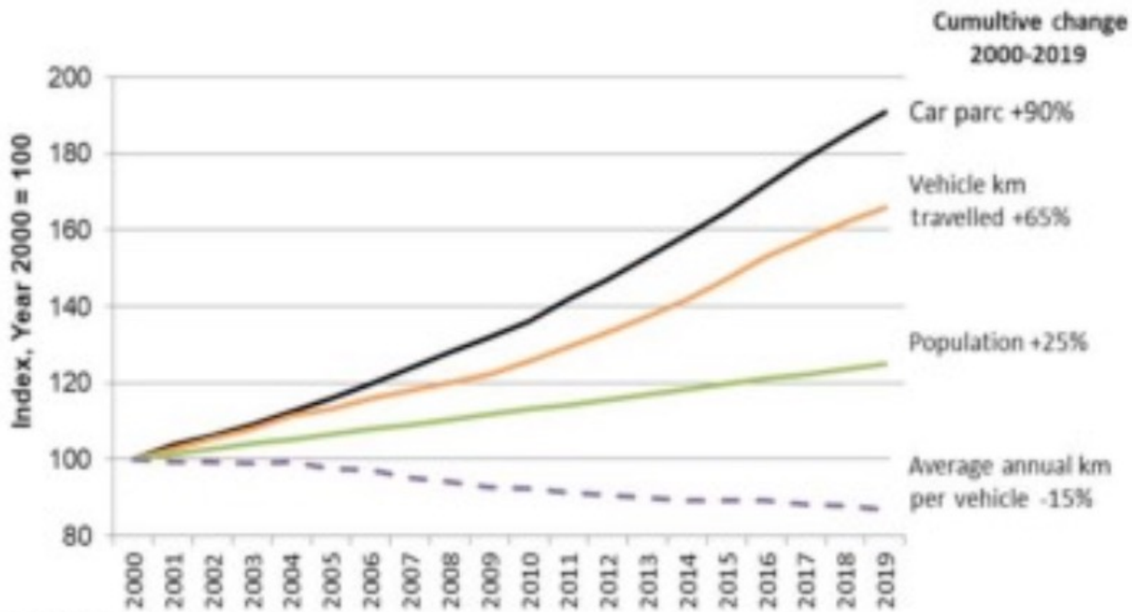


Figure 3.1 Trends in global mobility, indexed 2000—19. Source: Astutus Research.

Parc = # registered vehicles

More Tires Every Year

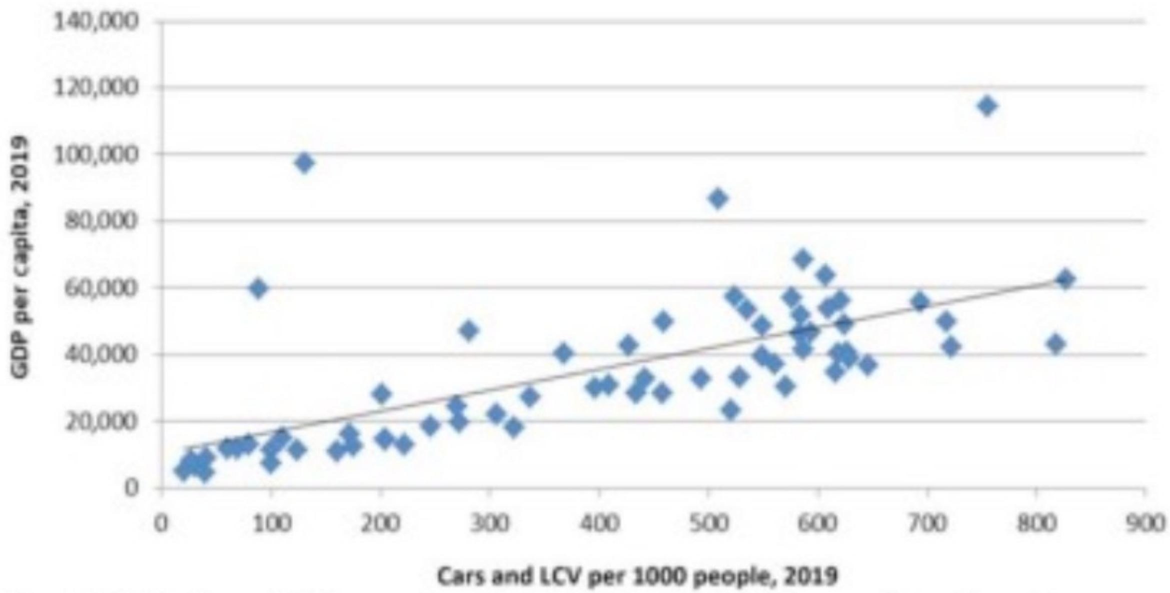


Figure 3.2 Correlation between GDP per capita and vehicle density, 2019. Source: Astutus Research.

More Tires Every Year

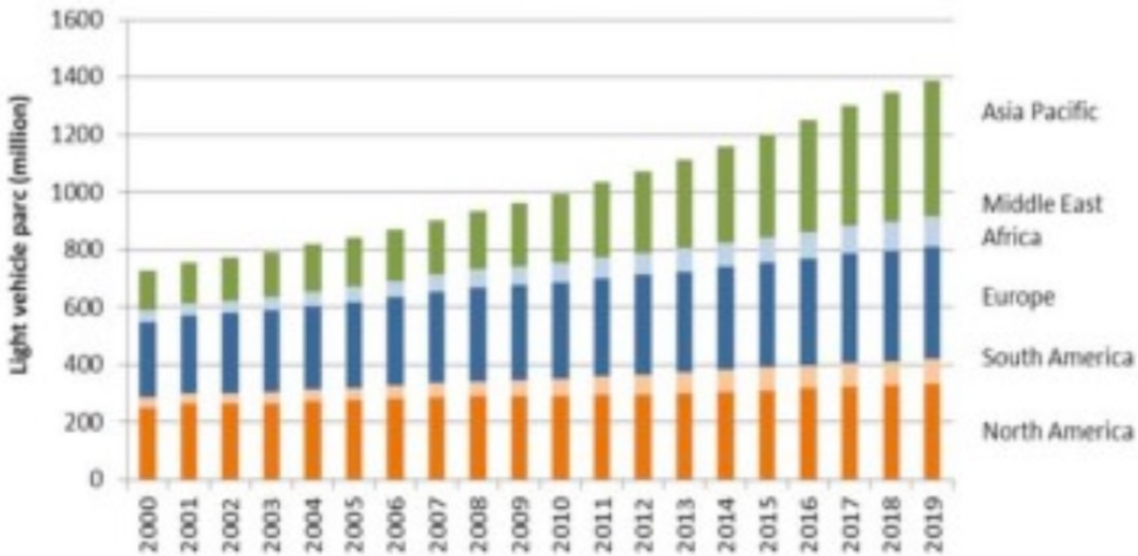


Figure 3.3 Global light vehicle parc (VIO) by region, 2000—19. Source: Astutus Research.

Parc = # registered vehicles

More Tires Every Year

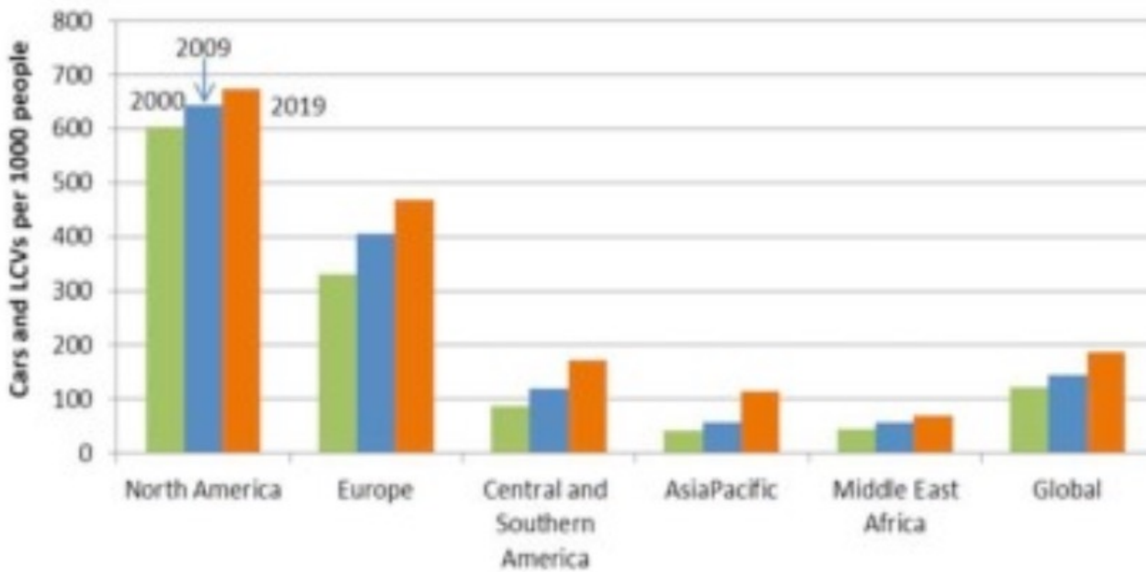


Figure 3.4 Light vehicle parc density by region, 2000—19. Source: Astutus Research.

Parc = # registered vehicles

End-of-Life Tires

Table 4.1 Examples of European Union waste streams (in tons).

Product	Use	Subset
Paper	±79,000,000	
Plastics	±37,000,000	
Packaging		±19,980,000
Glass	±15,000,000	
Aluminum	±8,860,000	
Rubber	±5,000,000	
Tires		±3,500,000

End-of-Life Tires

Table 4.3 Composition by weight European Union car/truck tires.

Material	Car/utility	Truck
Rubber/elastomers[a]	±48%	±52%
Carbon black and silica	±22%	±22%
Metals	±15%	±25%
Textiles	±5%	±-%
Zinc oxide	±1%	±2%
Sulfur	±1%	±1%
Additives	±8%	–

[a]Natural/synthetic rubber ratio: truck tires +1:2; car tires +4:3.

End-of-Life Tires

Table 4.4 Sustainable options.

Reuse: includes the sale of part-worn tires for domestic on-road and other uses as well as for export to countries with less restrictive road-use requirements.
Retreading: remanufactures a tire using as the core, a carefully selected, undamaged casing, which reduces production energy as well as virgin resources.
Recycling: transforms a waste into a raw material that can be reintegrated into the economic stream as a resource to substitute the use of virgin resources.
Recovery: transforms a waste into energy or fuel, which can be reintegrated into the economic stream as a resource to substitute the use of other energy sources.

Level 1 treatments: destruction of the structure of the tire

These treatments use car and truck tires as feedstock. They are simple mechanical means that destroy one or more of the physical attributes of the tire (i.e., shape, weight-bearing capacity, and rigidity, among others). They are designed to produce materials that can be directly used for simple products in civil or environmental engineering or as feedstock for further recycling. The most common methods include bead, sidewall, or tread removal; compression; baling; or cutting.

Level 2 treatments: liberation and separation of the elements of the tire

These treatments separate out the principal components of the material (i.e., the rubber, metals, and textiles). The most common technologies are ambient and cryogenic size reduction as well as some newer technologies such as microbes and water jetting, among others, to treat the tires.

Level 3 treatments: multitreatment technologies

This group of diverse treatments and technologies further processes the first and second level material outputs to modify one or more characteristics by means of mechanical, thermal, chemical, mechanochemical, or multitreatment procedures. The outputs of Level 2 are most often used as feedstock.

Level 4 treatments: material upgrading

Level 4 treatments refine, upgrade, modify, or generate specific characteristics or properties in materials produced by Level 3 treatments that most often provide the feedstock. Upgraded reclaim, reactivated, surface modified, or devulcanized materials, upgraded pyrolytic char (carbon products), and new compounds are among the most representative outputs.

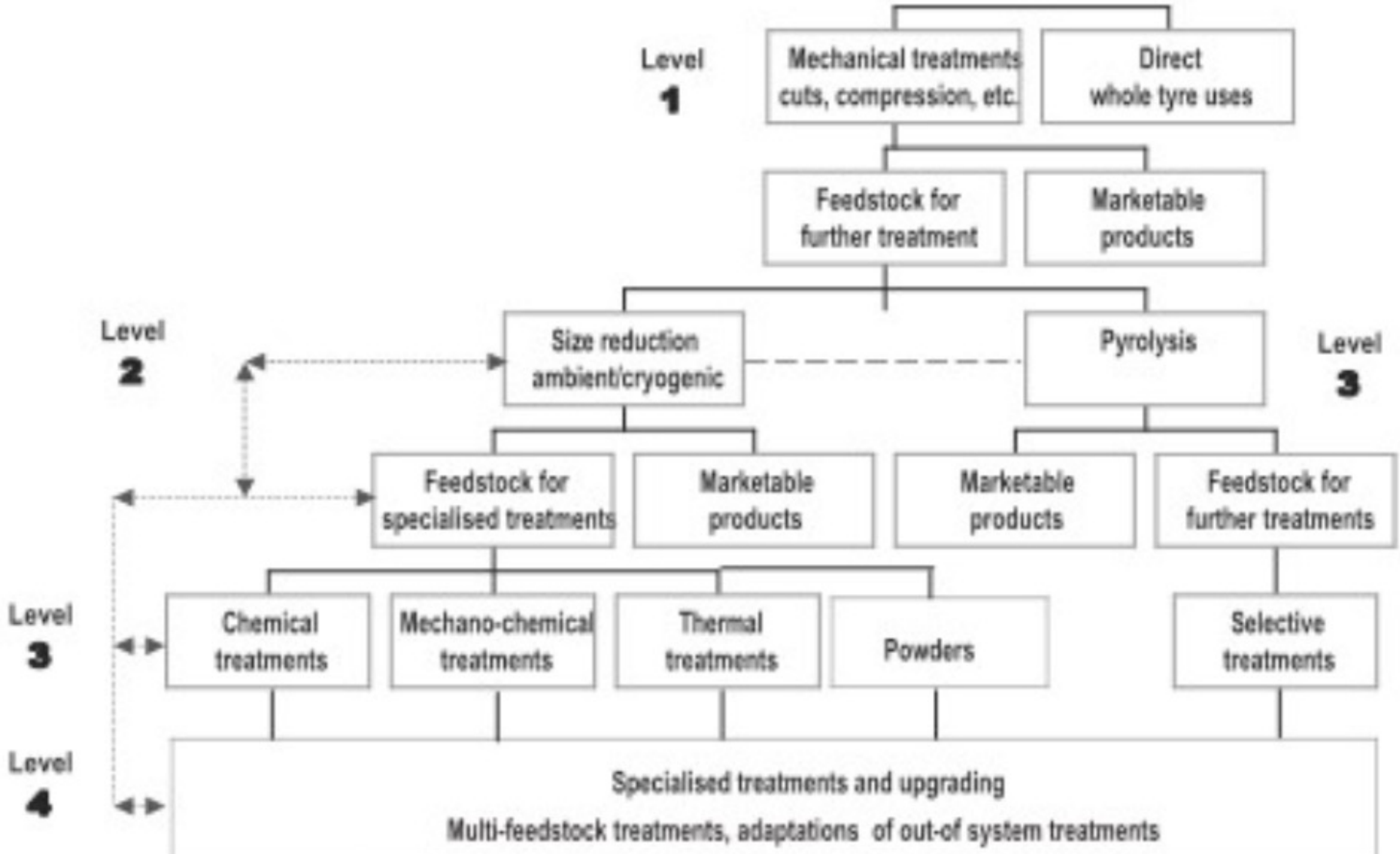
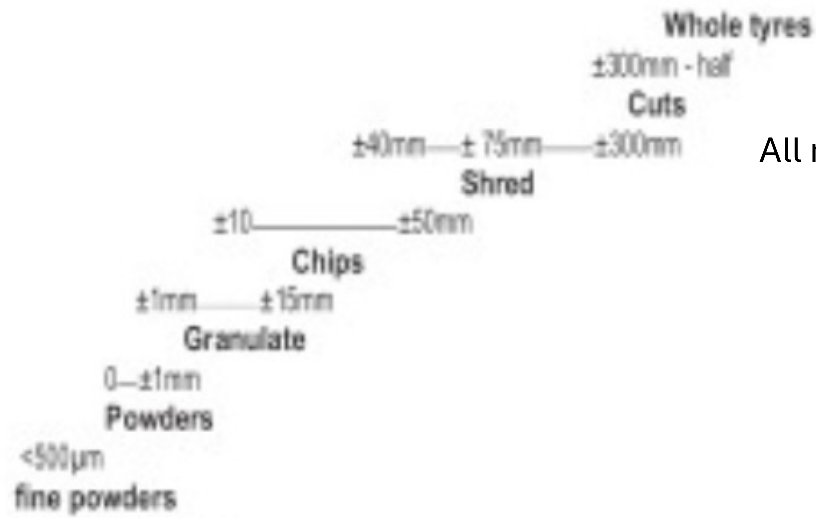


Figure 4.1 Schematic of the four levels of treatment.

End-of-Life Tires

Table 4.5 Percent of processed material per ton.

Material output	+% Product	+% Loss p/t
Shred and chips (unseparated)	95%	+5%
Extended shred (metal/fiber removed)	70%	+30%
Granulate (depends on mm) truck	60%	+40%
Granulate (depends on mm metal/textile out) car	50%	+50%
Powder	30%–40%	60%–70%



All mm

Figure 4.2 The range of recycled tire materials.

End-of-Life Tires

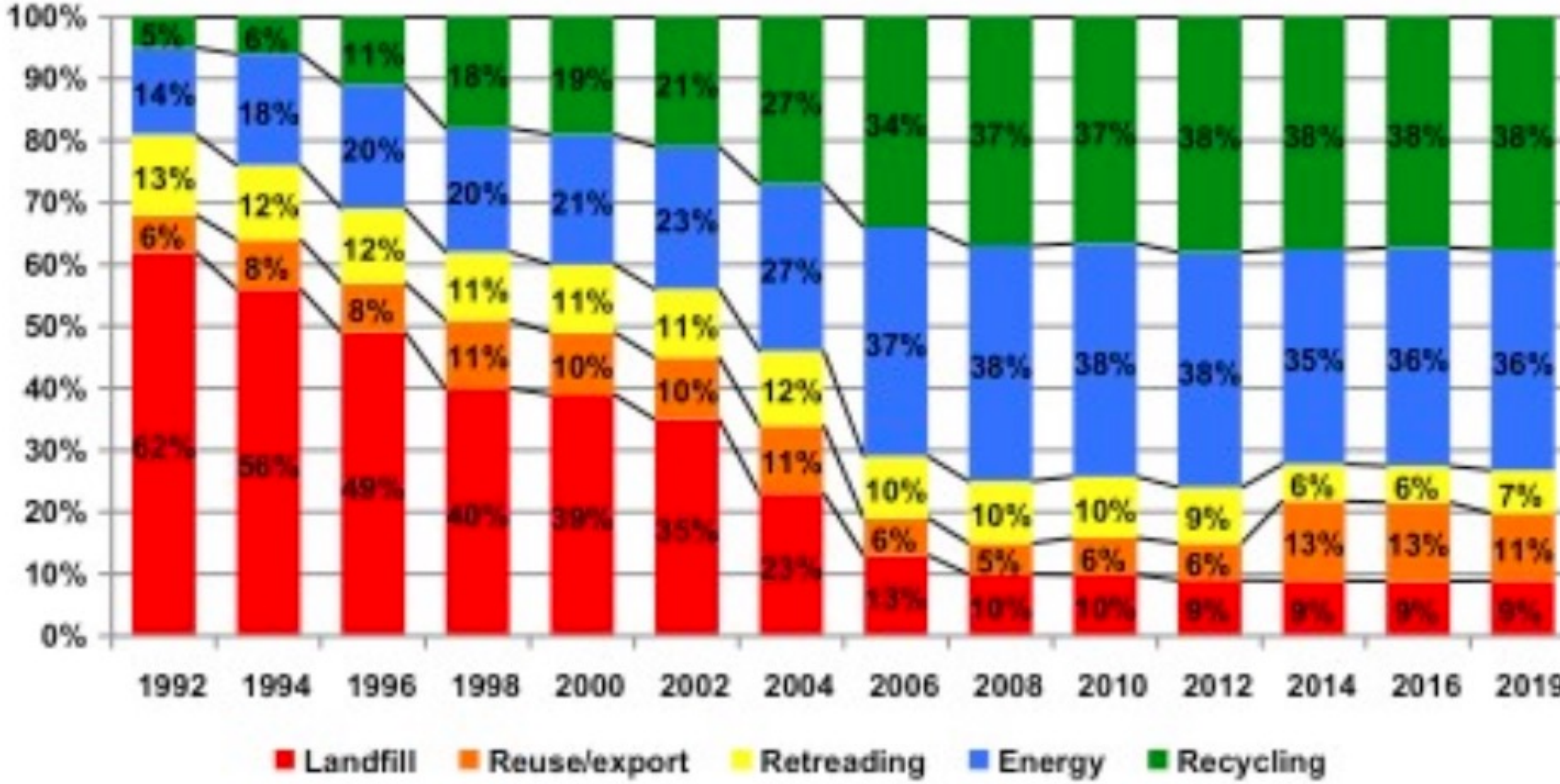


Figure 4.3 European Union recycling capacity 1992–2019 (ETRA 2020).

Table 4.8 Examples of recycled tire material applications.

Application	+Quantity	+Unit of application	Format
Sea embankment	3,000 car tires	500 × 1.5 m high	Whole
Sound barriers	20,000 truck tires	1 km × 3 m high	Whole/cut
Artificial reef	30,000 car tires	1 km × 1 m high	Whole/bale
Drainage culvert bed	50,000 tires	1 km long	Whole/cut/bale/shred*
Coastal stabilization	2,000 bales	1.3 m high × 1 km	Bales
Embankment	1,000,000 car tires	330 × 3 m high	Shred (compacted)*
Backfill	80–100 car tires	1 m^3	Shred (compacted)*
Bridge abutment fill	100,000 tires	1 m wide × 200 mm	Shred (compacted)*
Lightweight fill	2,700–3,600 km m^2	Layer thickness ±1–6 m	Shred (compacted)
Tram rail beds	50,000 tires	1 km	Shred (compacted)*
Equestrian track	15 tires	10 m^2 with 15 mm thick	Shred
Thermal insulation	300,000 tires	0.3 m thick × 10 m wide	chip/shred*
Drainage layer	300,000 tires	0.3 m thick × 10 m wide	chip/shred*
Road surface	70,000 tires	1 km 1lane road	Granulate
Play surface (25mil)	1,400 tires	~500 m^2	Granulate
Asphalt rubber.	3,500 tires	1 km × 12 m × 0.05 m	Granulate
Animal mattresses	18 tires	Unit	Granulate
Sound barriers	20,000 tires	1 km × 3 m high	Granulate
Running tracks	2,700 tires	400 × 7 m	Granulate
Infill for artificial turf	12,200 tires	Normal field	Granulate
Safety tiles	4 tires	1 × 1 × 0.04 m	Granulate
Elastic layers	3 tires	1 × 1 × 0.03 m	Granulate
Mats or sheets	1 tires	1 × 1 × 0.01 m	Granulate
Solid wheels (carts)	±1 ton of tires	±900 units	Granulate/powder
Antistatic shoe soles	1 tire	6 shoe soles (adult)	Powder
Pigments	112 tires	30–50 pigments	Powder

*Tire quantity depends on producer formula or specifications BRRC, BioSafe, ETRA, D. Humphrey, La Sapienza, Amirkhanian.

End-of-Life Tires

Table 5.1 Environmentally and economically sound uses for granulate, shred, and powders.

Application	Quantity	Unit of application	Format
Backfill	80–100 car tires	1 m^3	Shred (compacted)
Lightweight fill	2700–3600/km m^2	Layer thickness ±1–6 m	Shred (compacted)
Tram rail beds	50,000 tires	1 km	Shred (compacted)
Equestrian track	15 tires	10 m^2 with 15 mm thick	Shred
Thermal insulation	300,000 tires	0.3 m thick × 10 m wide	Chip/shred
Drainage layer	300,000 tires	0.3 m thick × 10 m wide	Chip/shred
Road surface	70,000 tires	1 km 1 lane road	Granulate
Play surface (25 mil)	1400 tires	~500 m^2	Granulate
Sound barriers	20,000 tires	1 km × 3 m high	Granulate
Running tracks	2700 tires	400 × 7 m	Granulate
Infill for artificial turf	12,200 tires	Normal field	Granulate
Elastic layers	3 tires	1 × 1 × 0.03 m	Granulate
Mats or sheets	1 tire	1 × 1 × 0.01 m	Granulate
Solid wheels (carts)	1 ton of tires	±900 units	Granulate/powder
Train/rail insulation	6 tires per profile	12 cmW × 18 cmH × 120 cmL	Granulate/powder
Antistatic shoe soles	1 tire	6 shoe soles (adult)	Powder
Membrane	5 tires	100 × 200 × 2 cm	Powder
Pigments	112 tires	30–50 pigments	Powder (rcb)
Automotive parts	2 tires	57 different molded parts	Thermoplastic powder

Tire Recycling

In the US

1990 1 billion tires
2015 67 million

Tires to Landfill

In 2017
13% sold as used tires

37% fuel in cement manufacturing

22% ground rubber

7% civil engineering

7% other uses (playground)

15% landfill

Beach in Ghana

15% Land Fill

Sulaibiya tire graveyard, Kuwait

Tire graveyard [edit]

The industrial area contains a waste disposal area that includes the world's largest tire dump.[10] It has been under development since at least 2010.[11] In April 2021, a fire was reported at the site.[12] In October 2020 a major tire fire in the graveyard was visible from space, burning 25,000 square meters of the deposit or about 1 million tires.[13] A previous fire happened in the site during 2012.[13] Both fires caused severe air pollution, and tire fires release large amount of heavy metals and oils that can contaminate the surrounding environment.[14] Following the fire, the Kuwait Environment Public Authority said it would dispose of the tires.[14]

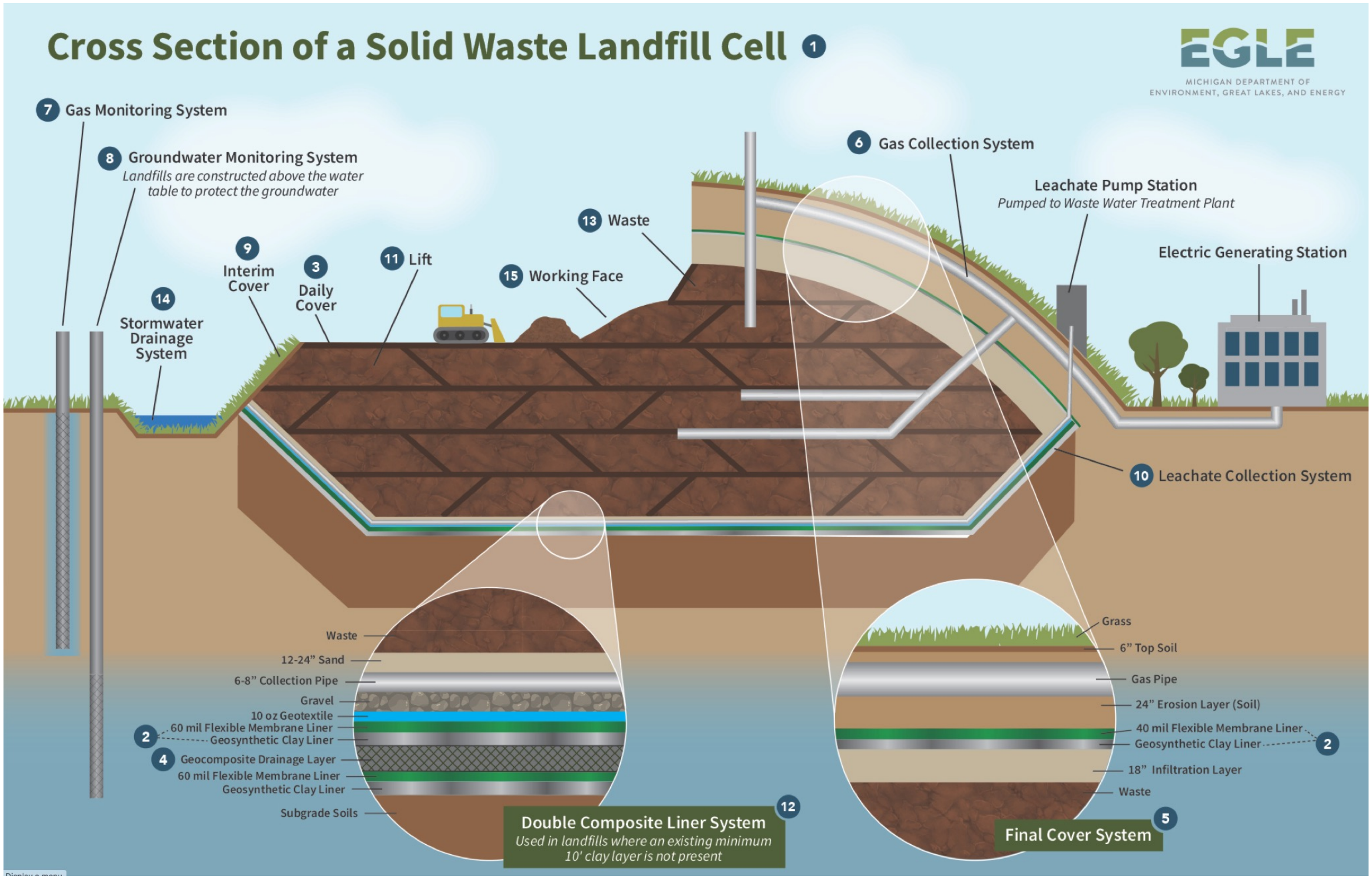
Video of fire fighting during the 2020 fire by the Kuwait Fire Force

https://twitter.com/kff_kw/status/1317053501869051904

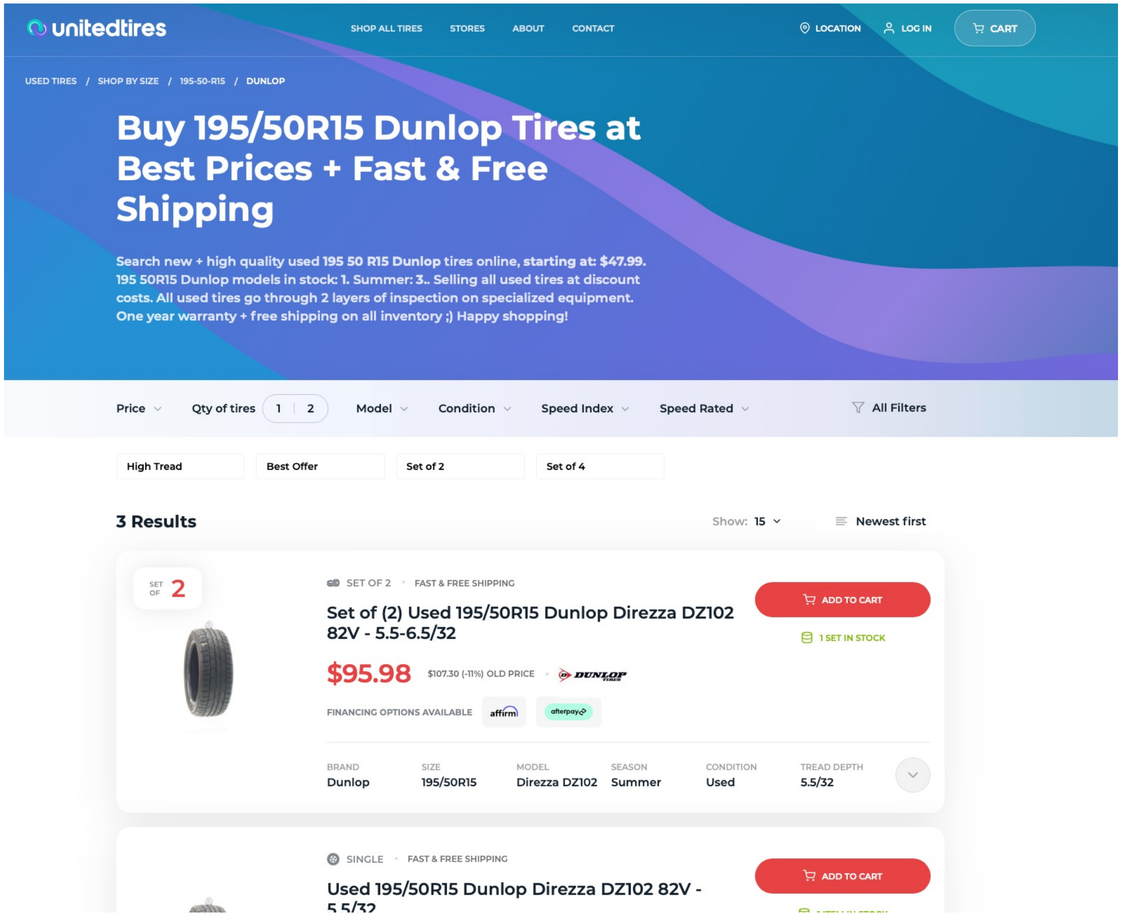
15% Land Fill

Alabama Landfill

1) Tires are 75% air so they take up a lot of space in a landfill
2) Tires can trap methane gas produced in a land fill, this gives tires buoyancy and they rise in the landfill. Engineered landfills have a layered structure with barrier PE film, tires rip through this structure and end up on the top
3) Leaching of tire additives could be a problem 6PPD-q for instance


Cross Section of a Solid Waste Landfill Cell 1
EGLE
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
7 Gas Monitoring System
8 Groundwater Monitoring System
Landfills are constructed above the water table to protect the groundwater
14 Stormwater Drainage System
9 Interim Cover
3 Daily Cover
11 Lift
15 Working Face
13 Waste
6 Gas Collection System
Leachate Pump Station
Pumped to Waste Water Treatment Plant
Electric Generating Station
10 Leachate Collection System
Waste
12-24" Sand
6-8" Collection Pipe
Gravel
10 oz Geotextile
60 mil Flexible Membrane Liner
Geosynthetic Clay Liner
2
4 Geocomposite Drainage Layer
60 mil Flexible Membrane Liner
Geosynthetic Clay Liner
Subgrade Soils
12 Double Composite Liner System
Used in landfills where an existing minimum 10' clay layer is not present
Grass
6" Top Soil
Gas Pipe
24" Erosion Layer (Soil)
40 mil Flexible Membrane Liner
Geosynthetic Clay Liner
2
18" Infiltration Layer
Waste
5 Final Cover System

Used Tires


unitedtires
SHOP ALL TIRES
STORES
ABOUT
CONTACT
LOCATION
LOG IN
CART
USED TIRES / SHOP BY SIZE / 195-50-R15 / DUNLOP
Buy 195/50R15 Dunlop Tires at Best Prices + Fast & Free Shipping
Search new + high quality used 195 50 R15 Dunlop tires online, starting at: $47.99. 195 50R15 Dunlop models in stock: 1. Summer: 3.. Selling all used tires at discount costs. All used tires go through 2 layers of inspection on specialized equipment. One year warranty + free shipping on all inventory ;) Happy shopping!
Price
Qty of tires 1 2
Model
Condition
Speed Index
Speed Rated
All Filters
High Tread
Best Offer
Set of 2
Set of 4
3 Results
Show: 15
Newest first
SET OF 2
SET OF 2 · FAST & FREE SHIPPING
Set of (2) Used 195/50R15 Dunlop Direzza DZ102 82V - 5.5-6.5/32
$95.98
$107.30 (-11%) OLD PRICE
ADD TO CART
1 SET IN STOCK
FINANCING OPTIONS AVAILABLE
BRAND Dunlop
SIZE 195/50R15
MODEL Direzza DZ102
SEASON Summer
CONDITION Used
TREAD DEPTH 5.5/32
SINGLE · FAST & FREE SHIPPING
Used 195/50R15 Dunlop Direzza DZ102 82V - 5.5/32
ADD TO CART

Liberty TIRE RECYCLING

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Buy Used Tires

Home > Buy Used Tires

Delivering Used Tires to Wholesalers and Retailers Worldwide

Liberty Tire Recycling sells and delivers used tires to wholesalers and retailers worldwide. We carry used passenger, light truck, virgin truck, regroovable truck, agricultural and off-the-road (OTR) tires. Additionally, we sell truck tire casings and OTR casings. We offer rim sizes from 14 inches to 26 inches, and professionally load trailers so they can safely carry the highest possible capacity, saving you time and money.

QUALITY + SAFETY

Our standardized quality inspection process and highly trained grading specialists help us maintain an industry-leading position.

35+ FACILITIES

Our sites located in multiple states mean we can reduce your freight costs and expedite your deliveries.

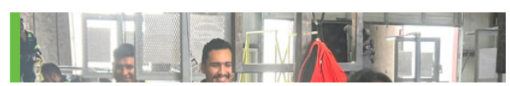
DELIVERY WORLDWIDE

We provide freight delivery anywhere in the U.S., Canada, Mexico and the world. You name the place, and we'll get it there.

BILINGUAL

Our sales team members speak English and Spanish so you can conduct business in your preferred language.

Benefits of Reuse



Retread Tires (Mostly Truck/Airplane Tires)

Short Haul Truck tires are retreaded 5-6 times, long haul 3-4 times
Airplane tires are retreaded 7 or more times (tires changed after 100 landings)
65% of the original material is reused in a retread.

Retread Tires (Mostly Truck/Airplane Tires)

Retread Tires (Calfornia)

Cement 37% of Waste Tires

$CaCO_3$ (limestone) => CaO (Lime) + CO_2

<850°C typically 1500 to 1650°C this is where tires come in
This reaction is responsible for 8% of CO_2 emissions

2 or 3 CaO + SiO2 (silica/sand) => (2 or 3) CaO SiO_2 — Dicalcium or tricalcium silicate

3 CaO + Al_2O_3 (alumina Clay or Fly Ash) => 3CaO Al_2O_3 — Tricalcium aluminate

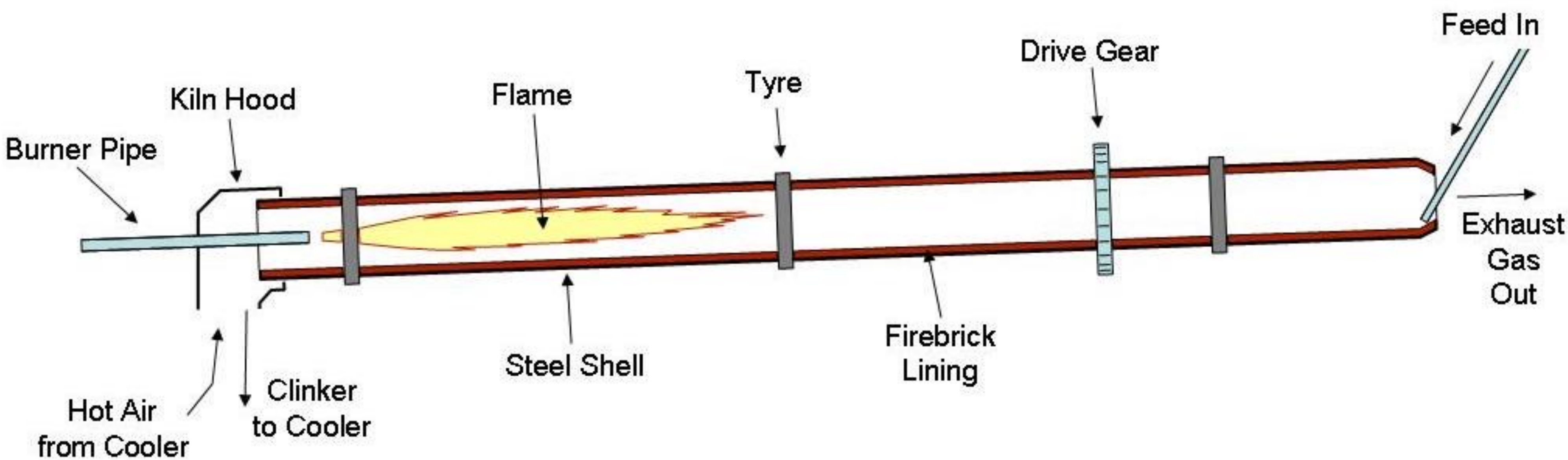
4 CaO + Al_2O_3 (alumina Clay) + Fe_2O_3 => 4CaO Al_2O_3 Fe_2O_3 — Brown millerite

Result is called clinker and is ground to a caustic (pH 13) powder

To use mix with water and exothermically form hydrates

At 1,600°C you can use anything as fuel and there are no byproducts except CO_2 and NO_x
Hazardous Waste, sewage sludge, tires
Hazardous metals are incorporated into the clinker and finally into the concrete

Cement


Feed In
Drive Gear
Tyre
Flame
Kiln Hood
Burner Pipe
Exhaust
Gas
Out
Firebrick
Lining
Steel Shell
Clinker
to Cooler
Hot Air
from Cooler

Cement

Cement

Paper Mills

1998 Governor's Awards for Environmental Excellence

International Paper Company, Lock Haven Mill

INDUSTRIAL RECYCLING

International Paper operates 27 pulp, paper and paperboard mills in the United States. Its Lock Haven Mill produces 700 tons per day of paper under the Hammermill and Springhill brand names.

28.8k video 56k video

The Lock Haven Mill substituted old tires for coal to produce steam in the mill's paper manufacturing process. The 15 percent tire derived fuel mixed with bituminous coal has a high BTU value and is more economical than pure bituminous coal.

Approximately 9,000 shredded tires are burned daily eliminating the need to landfill approximately 3.2 million tires annually. The waste tires burned at the Lock Haven Mill which come from Pennsylvania, represent 15 percent of International Paper's daily boiler fuel supply. Use of these tires has reduced company fuel costs by $200,000.

Burning tire-derived fuel in the Lock Haven Mill boilers also resulted in a decrease of nitrogen oxides and particulate emissions into the air. It saves about 25,000 tons of bituminous coal and represents an energy savings of 600 billion BTUs annually.

The Lock Haven Mill, while promoting the use of tire derived fuel at other International Paper facilities, is an example for other companies on the environmental benefits of burning this fuel. The company has implemented a corporate outreach effort to educate others on the operational, environmental and economic benefits of tire derived fuel.

International Paper Company, Lock Haven Mill
P.O. Box 268
South Highland St.
Lock Haven, PA 17745
Clinton County

Contact:
Julie Brennan
717-748-1246
717-748-1244 (fax)

Organization Type:
Large Business

Waste Reductions:
9,000 tires burned daily
3.2 million tires annually

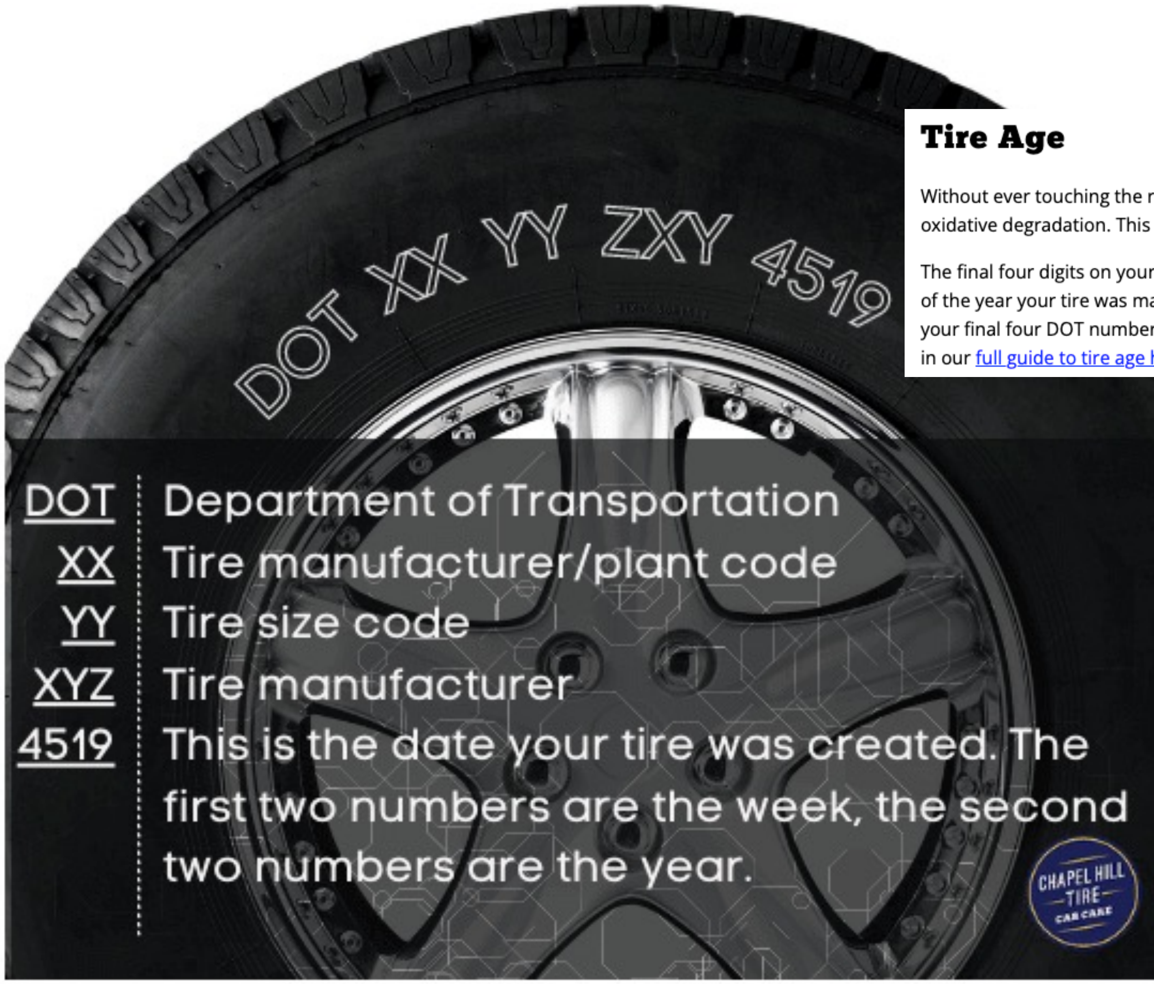
Financial Benefits:
$200,000 annual fuel cost savings

Other Benefits:
Increased public/ community awareness

"The use of TDF reduces the number of tires being placed in landfills. Currently the Lock Haven Mill is burning an equivalent of 9,000 tires daily."
-Julie Brennan

22% Ground Rubber

DOT Code



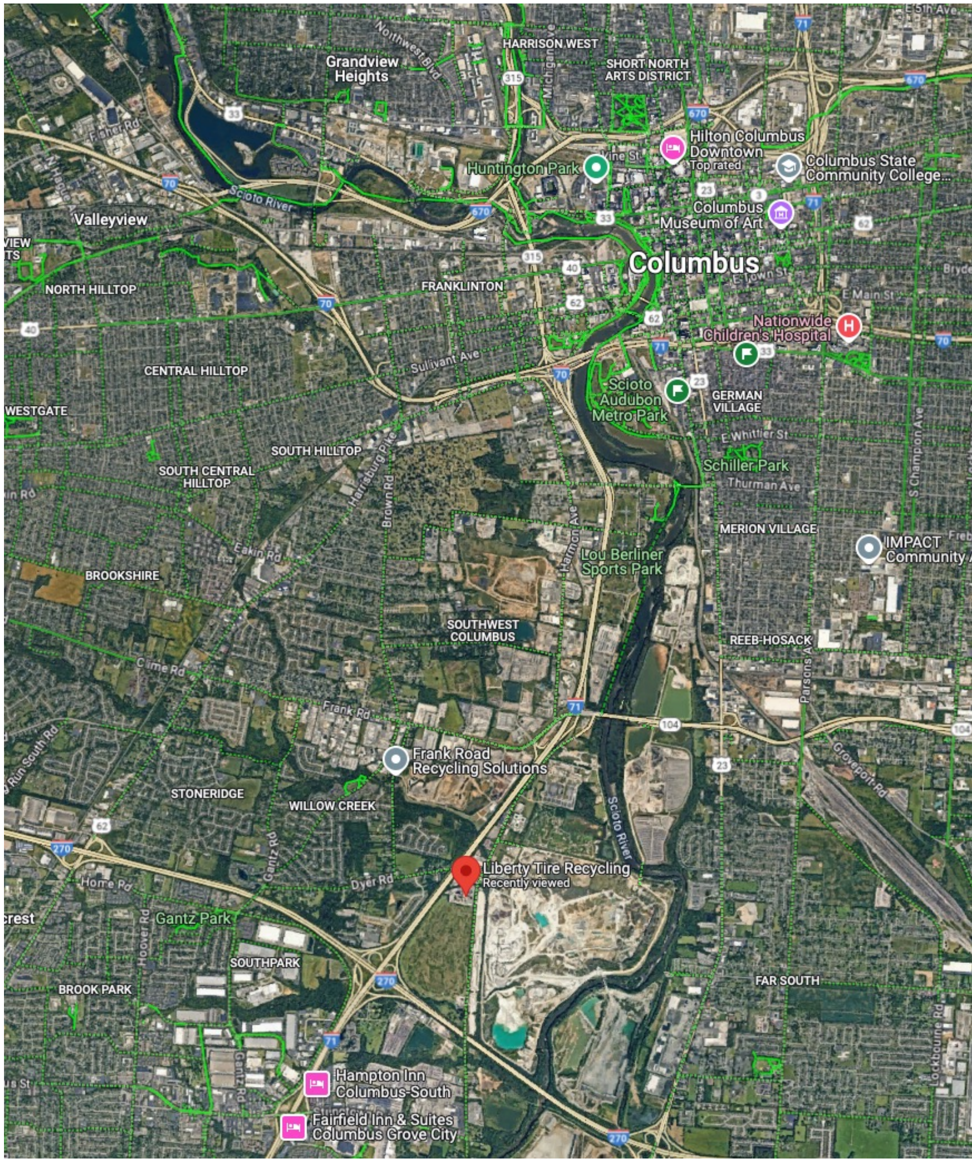
Tire Age

Without ever touching the road, a tire can go bad simply due to its age. After 5 years of age, tires begin experiencing thermo-oxidative degradation. This chemical reaction can severely impact tire safety on the road.

The final four digits on your DOT number will tell you the tire's age. The first two numbers of this grouping indicate the week of the year your tire was manufactured. The final two digits indicate the year that your tire was manufactured. For example, if your final four DOT numbers are 3020, your tire was manufactured in the 30th week of 2020. You can find more information in our full guide to tire age here.

You can't reuse/retread a tire older than 2019

ecycling


Grandview Heights
HARRISON WEST
SHORT NORTH ARTS DISTRICT
Hilton Columbus Downtown
Top rated
Huntington Park
Columbus State Community College...
Valleyview
Columbus Museum of Art
Columbus
NORTH HILLTOP
FRANKLINTON
Nationwide Children's Hospital
CENTRAL HILLTOP
WESTGATE
Scioto Audubon Metro Park
GERMAN VILLAGE
SOUTH HILLTOP
SOUTH CENTRAL HILLTOP
Schiller Park
MERION VILLAGE
IMPACT Community A
BROOKSHIRE
Lou Berliner Sports Park
SOUTHWEST COLUMBUS
REEB-HOSACK
Frank Road Recycling Solutions
STONERIDGE
WILLOW CREEK
Liberty Tire Recycling
Recently viewed
Gantz Park
SOUTHPARK
BROOK PARK
FAR SOUTH
Hampton Inn Columbus-South
Fairfield Inn & Suites Columbus Grove City


Marsh Run
Liberty Tire Recycling


3041
3041
3041
3041
Trails
Bicycle-friendly roads


Liberty Tire Recycling
Jackson Pike
104
Jackson Pike
104

How We Revolutionize Value

Leveraging the largest network of tire recycling facilities in North America, we collect scrap tires and offer remediation services for abandoned tire piles to improve a community's health and safety. Once we gather the tires, we process them, reselling ones that can still be safely used and breaking down the others into raw materials so they can be given a second life. Manufacturers then use the recycled rubber to create safe products like molded rubber goods, rubber mulch, rubberized flooring, rubberized asphalt and shock-absorbing athletic surfaces.

All our services work together seamlessly to create a greener tomorrow. Combine those with the ingenuity, determination and passion at our core, we help our partners gain competitive advantages and solve problems. Not only are our services beneficial for the environment but they provide opportunities for us to add value for you.

TIRE COLLECTION

We collect scrap tires of every shape and size. To better serve you, we offer two collection options: backdoor pickups that keep your facility safe and clean and drop-and-hook pickups that allow you to fill trailers at your convenience.

TIRE PROCESSING

Using innovative tools and technologies, we assess which tires can be resold and transform the rest into reusable raw materials like crumb rubber and industrial feedstock. All aspects of the tire get recycled, including the fiber and steel wire.

TIRE REMEDIATION

We clean up sites with abandoned tires to mitigate the health and environmental risks these spots pose to communities. To date, we are proud to have remediated more than 150 dump sites with nearly 40 million scrap tires in nine states.

Tire Recycling

Commercial Products

Asphalt / SmartMix

Crumb Rubber

Commercial Landscaping

Commercial Playgrounds

Tire-Derived Aggregate

Tire-Derived Fuel

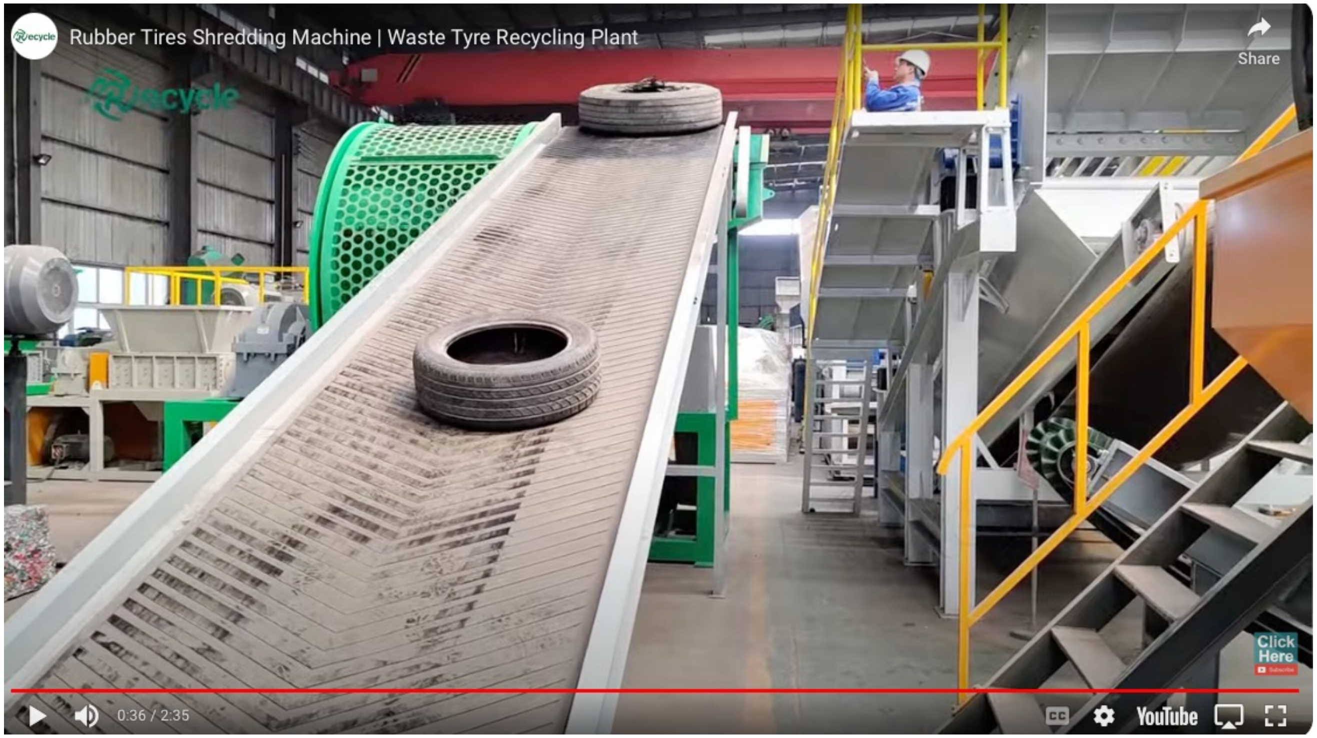
Wire

Retail Products

Retail Landscaping Products

Retail Playground Products

Tire Shredder



Tire Shredder

Total rubber processing from tire to powder and steel

Rubberized Aspalt

What is Rubberized Asphalt and What Are SmartMIX Asphalt Additives?

Rubberized asphalt takes traditional asphalt and adds crumb rubber to give the asphalt material more flexibility and resistance to cracking. Recycled tire rubber can increase a road's durability, make it quieter and increase skid resistance to make it safer for drivers.

SmartMIX stands for Sustainable Material with Asphalt Rubber Technologies. It is a line of dry mix rubber additives for high-performance paved surfaces and is a next generation technology for rubberized asphalt. It uses proprietary technology to provide a pre-swelled, reacted rubber particle that can be simply incorporated into an asphalt mixture at the mix plant. The easy integration of SmartMIX doesn't require an additional binder, elevated mixing temperatures, longer mixing times or lengthy storage times.

Cost-Effective, Transformative Technology

SmartMIX asphalt additives match the performance of other modified mixes but at a lower price point and with less waste. Our additives cost up to 15% less per ton and allow up to a 50% reduction in modifier costs. Plus, SmartMIX increases the life of pavement, which further reduces maintenance needs and investments over time.

Achieve Circular Sustainability

All tires included in SmartMIX are recycled tires, and the technology's materials are also 100% recyclable. Our dedication to sustainability grows even stronger since SmartMIX asphalt additives have fewer emissions than wet-processed rubber or polymer mixes and allow you to eliminate product waste.

Use More Reclaimed Asphalt Pavement

With SmartMIX you can maximize the amount of reclaimed asphalt pavement (RAP) you use – up to 50% – since SmartMIX reduces mix stiffness and brittleness. Our additives make the asphalt more crack resistant as well as easier to handle during installation.

Simplify Your Mixing Process

Because SmartMIX comes to you ready to use, it eliminates the need for elevated mix temperatures, as well as extra mixing time waiting for the rubber to swell and react with the asphalt. The rubber that arrives at your facility is already reacted, saturated and swelled. Being a dry mix that is turnkey also makes small-scale projects possible since you don't need to spend tens of thousands on specialized equipment and storage tanks.

Plus, our dry mix additive line:

- Adds flexibility and durability to asphalt mixtures
- Resists cracking
- Is scalable
- Removes industry barriers, giving plants of all sizes across the continent the ability to create this beneficial product to improve their community
- Minimizes bottom-up and reflective cracking in interlayers and underlayers
- Creates fewer fumes than wet-processed rubber or polymer mixes
- Is more workable than most other polymer or rubber modified mixes

Crumb Rubber

What is Crumb Rubber?

Crumb rubber is made of recycled tires that are cleaned, ground into smaller pieces and screened to obtain uniform sizes. Crumb ranges from particles so tiny they resemble dust to pieces about one-half inch long, or a little smaller than a dime.

Crumb rubber offers the most versatility for recycled tires and arguably the highest value, as compression and injection molders, paving companies and synthetic turf installers use it to design a wide range of helpful products we encounter every day.

Versatile at the Core

Regardless of how it's used, crumb rubber is the material of choice to lower costs, improve safety and advance lives. Beyond its sustainability, since it is made from recycled tires, rubber's inherent properties are game changers in a vast number of industries, from consumer products to paving applications.

For compression molding, crumb rubber is elastic, durable and less expensive than virgin alternatives. Floor mats, weightlifting plates and playground products last longer when made with recycled rubber.

For sports infill, rubber is used in more than 80% of the synthetic turf fields nationwide. It drains more rapidly than any other infill product, dries quickly and is the most shock-absorbent infill material that can be used to protect kids and athletes alike from more serious injury.

For running tracks, crumb rubber is an excellent choice for a value-based system that provides a resilient, non-slip surface. It is also widely used as a base mat for a more specialized track surface.

For rubberized asphalt, including crumb rubber in roads makes them quieter, reduces stopping distances and can lower long-term maintenance costs.

With ground rubber, the possibilities are virtually endless. Are you looking for a material that is:

- Extremely durable
- Resistant to cracking
- Good ductility
- More cost-effective than virgin alternatives
- Excellent shock-absorbing properties
- 100% recycled material

Liberty Tire Recycling produces more than 500 million pounds of crumb rubber annually, making us the company to contact for all projects where topnotch ground tire rubber is needed.

What Are Commercial Rubber Landscaping Products?

When designing outdoor spaces, you're in need of beautiful products that create a clean, appealing look and ones that will ultimately save you and your clients time and money. Commercial rubber landscaping products are made of 100% recycled rubber, which means using the products helps the environment by giving the rubber a second life. Some of our innovative products include rubber mulch, premium landscape edging, shock-absorbing pavers, tree rings to prevent weed growth, and splash blocks for gutters. These safe items come in a variety of styles and colors to fit any design aesthetic.

What Are Commercial Rubber Playground Products?

Our standout rubber playground products are safe, durable and cost-effective. We have a diverse selection of products that include rubber mulch (loose and bonded), poured-in-place surfaces, borders and mats that add extra layers of protection in the playground and park setting. All our playground products are made from 100% recycled rubber, making it a sustainable option, and our rubber mulch is IPEMA certified for safe use on playgrounds. Rubber's shock-absorbing properties keep children safer than alternatives and reduce the risk of serious injuries.

What is Tire-Derived Aggregate?

Tire-derived aggregate (TDA) is made of shredded end-of-life tires and used as a sustainable and lightweight alternative to natural aggregate. The shreds can vary in size and are used as drain-fill material, backfill, permeable fill for infrastructure, and insulation. Organizations choose TDA for a variety of reasons—it is lightweight, offers improved drainage, achieves a higher insulation value and absorbs vibrations better than conventional sand, gravel and rock. Plus, customers are using existing material rather than mining for virgin aggregate.

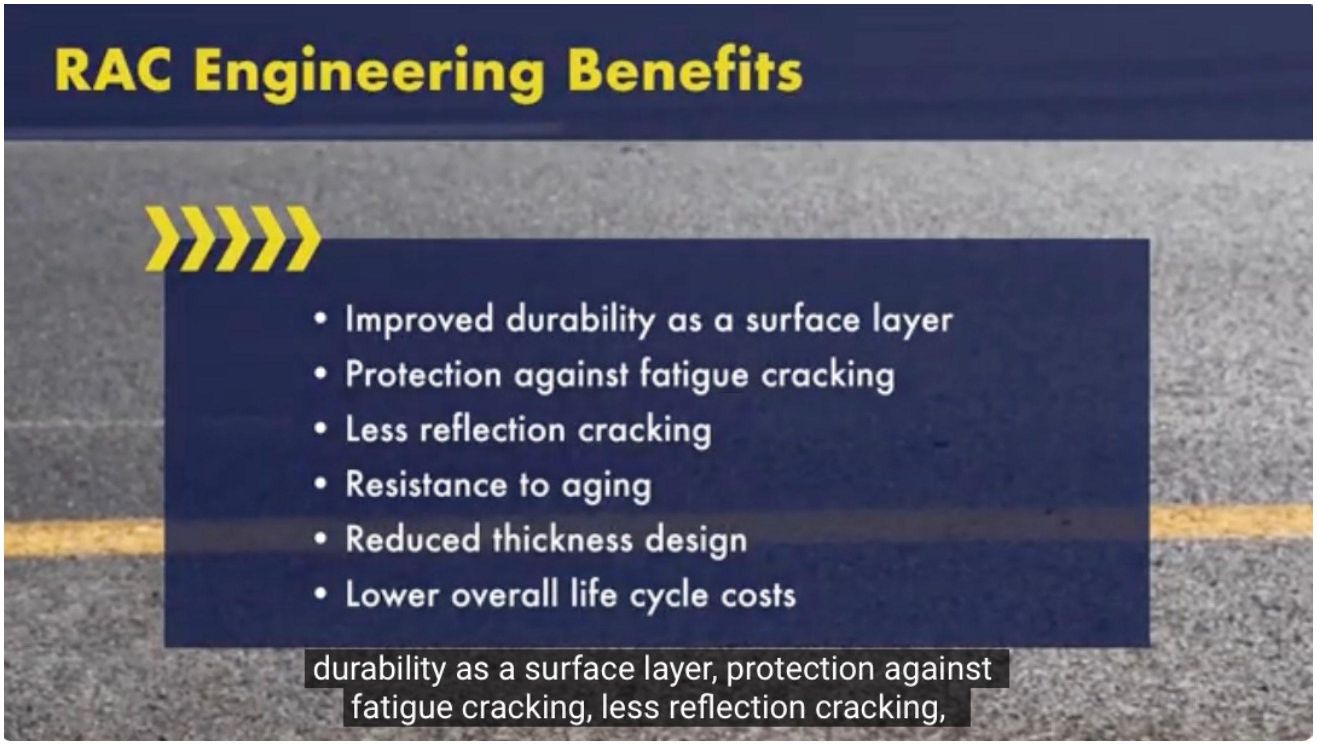
What is Tire-Derived Fuel?

Tire-derived fuel (TDF) is made of shredded end-of-life tires and is mixed with other energy sources in industrial settings. The U.S. Environmental Protection Agency recognizes TDF as a viable alternative to fossil fuels and prefers using tires as energy as opposed to disposing them in landfills. Tire-derived fuel is usually customized by tire size and wire content to meet a customer’s fuel specifications. TDF is often selected as a supplemental energy source because it emits lower carbon emissions than coal, natural gas and petroleum coke, and is more cost-effective with its high BTU value.

What is Recycled Wire?

Recycled tire wire is the steel taken from end-of-life tires. Drawn out by magnets, as well as vibrating belts and tables, tire steel is high-quality and has an impressive level of carbon content. Our wire sorting equipment is tested annually to ensure our processes and machines are removing as much rubber from the steel as possible to maintain excellent, consistent quality standards. Steel manufacturers find recycled tire wire attractive because it achieves cost savings and reduces their carbon footprint at the same time.

Rubberized Asphalt Concrete



Tire Derived Aggregate (TDA)

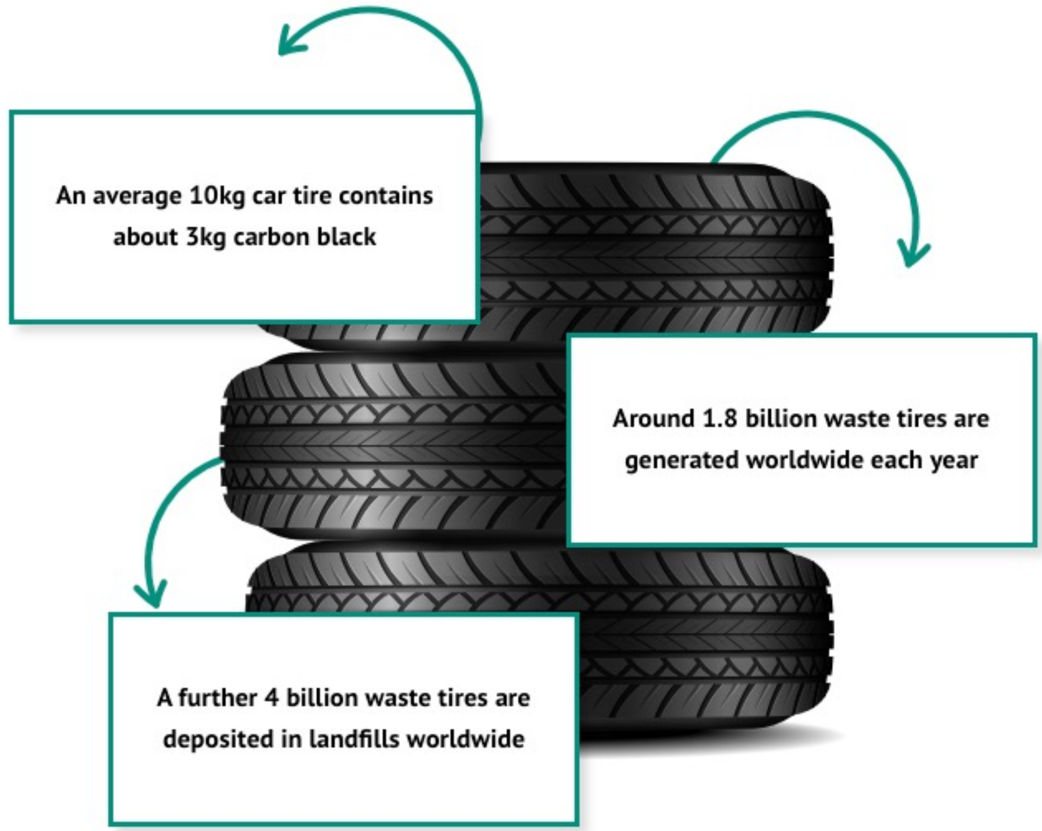
[Tire Derived Aggregate (TDA) For Raliroads](#)

[Tire Derived Aggregate (TDA) For Road Repair]

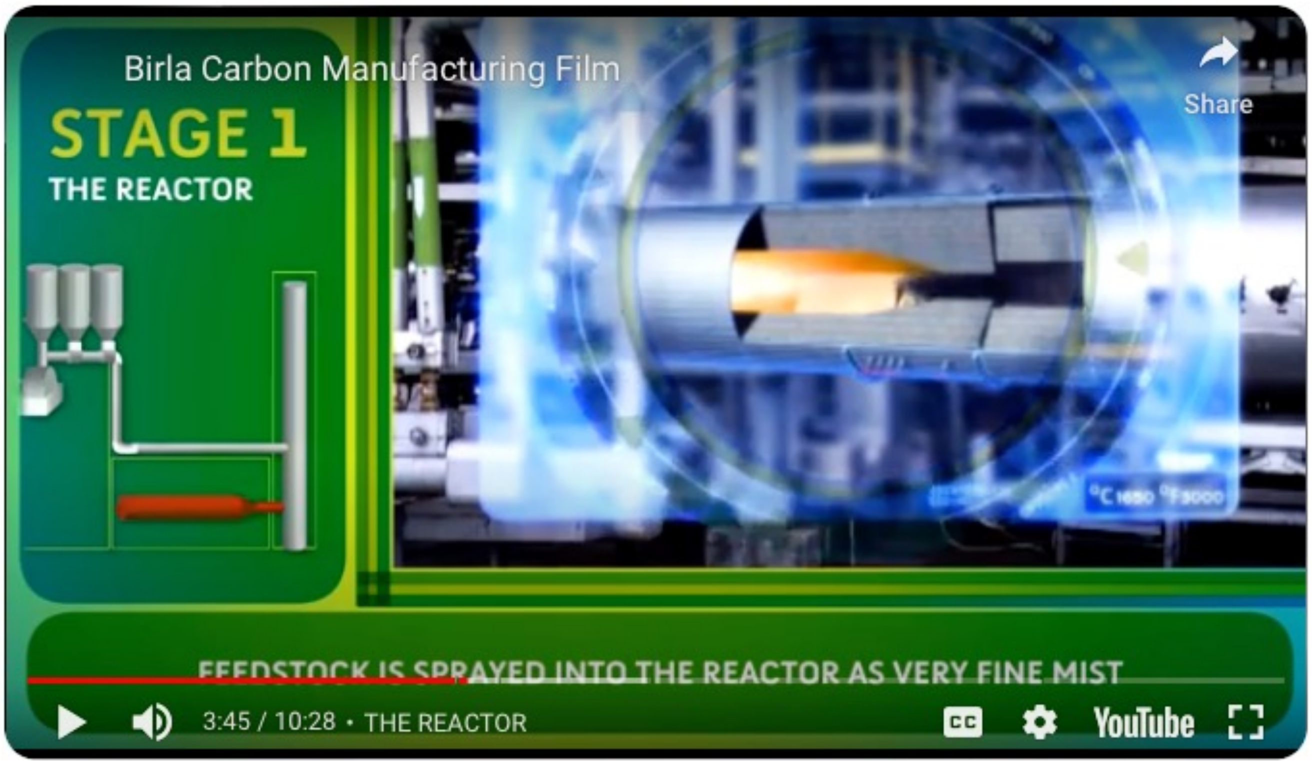
Recovered Carbon Black

Carbon Black Recovery

About 1.5 tons of fossil fuel raw materials and large amounts of water are used to produce 1 ton of carbon black. During the Furnace process, approximately 2.5 – 3.0 tons of CO_2 emissions are released per ton of carbon black produced. As a result, the production of carbon black contributes greatly to the release of greenhouse gases and the associated problems. In order to reduce CO_2 emissions and the consumption of fossil raw materials and water, processes for the efficient recovery of carbon black must be developed and established. In particular, tire waste is considered to be the most important source of carbon black in this respect. Around 4 billion waste tires are deposited in landfills worldwide and around 1.8 billion waste tires are added each year. Considering that an average car tire contains about 3 kg of carbon black, it becomes clear what gigantic raw material stock for Carbon Black is theoretically available.



Synthesis of Carbon Black



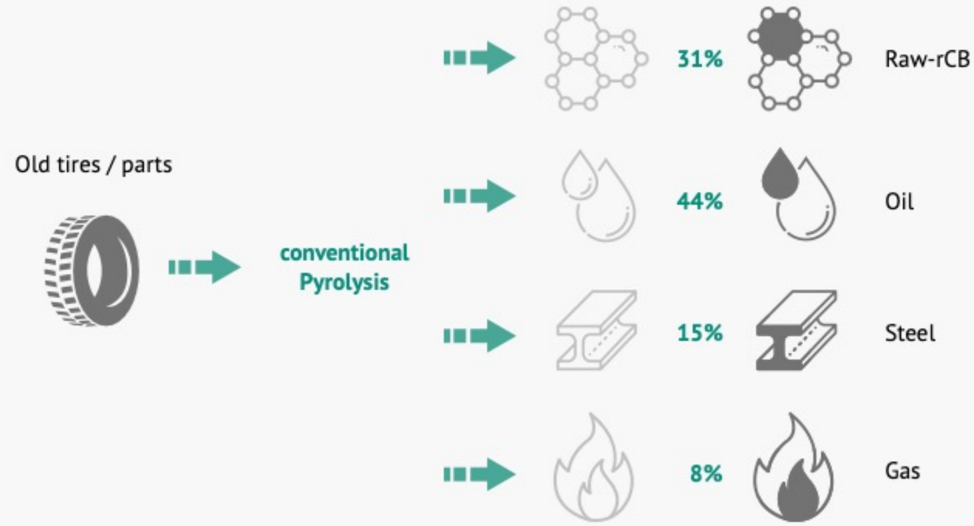
Recovered Carbon Black

Basic process Pyrolysis: raw material extraction

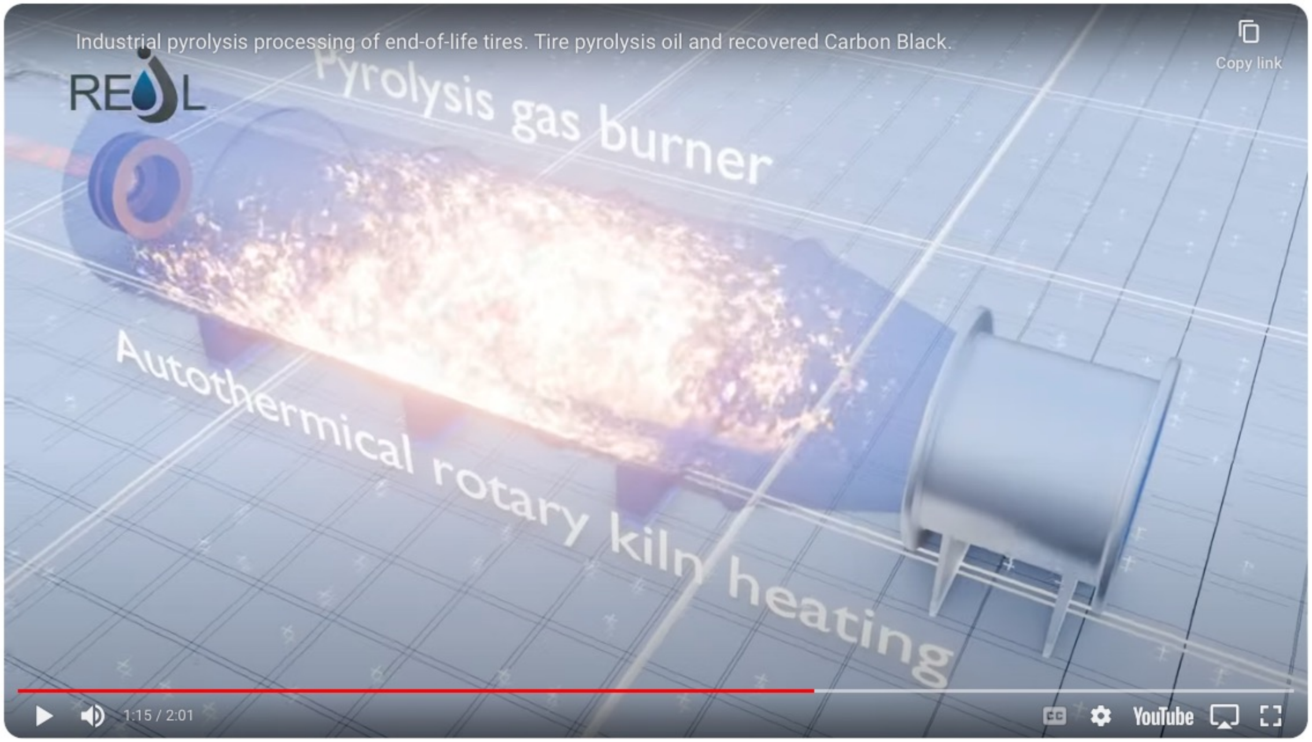
Through a thermal process under the exclusion of oxygen (pyrolysis) the used tires are processed. First, the organic compounds of the used tire are broken down. The gases produced in the process are condensed, resulting in so-called TPO (Tire Pyrolysis Oil). The oil produced is sold and used for energy production in industrial settings or further processed in refineries. At the end of the process, a carbon-containing residue remains – the so-called raw-recovered carbon black (raw rCB).

In addition to "Carbon Black", this residual material also contains up to 25% ash, which consists of additives used in tire production. These are mainly silica compounds and zinc components.

Nanotechnology is a key to a more sustainable future



Recovered Carbon Black



The recovery process at a glance

Step 1: Thermal post-treatment of the raw rCB +

Step 2: Chemical cleaning of the raw rCB to recover the carbon black –

The method developed by Fraunhofer IBP (patent filed) is based on a wet chemical (hydrothermal) treatment of the already thermally treated raw rCB. The ash is almost completely extracted and converted into usable products. The process complies with the latest ECO guidelines and does not produce toxic waste.

The innovative process leads to three high-quality products

1. Recovered Carbon Black

The rCB has a carbon content of +96%. It is ground to a very fine particle size of less than 10 microns, pelletized, dried and then packaged. Thus, it is delivered to customers in the same form as standard carbon black.

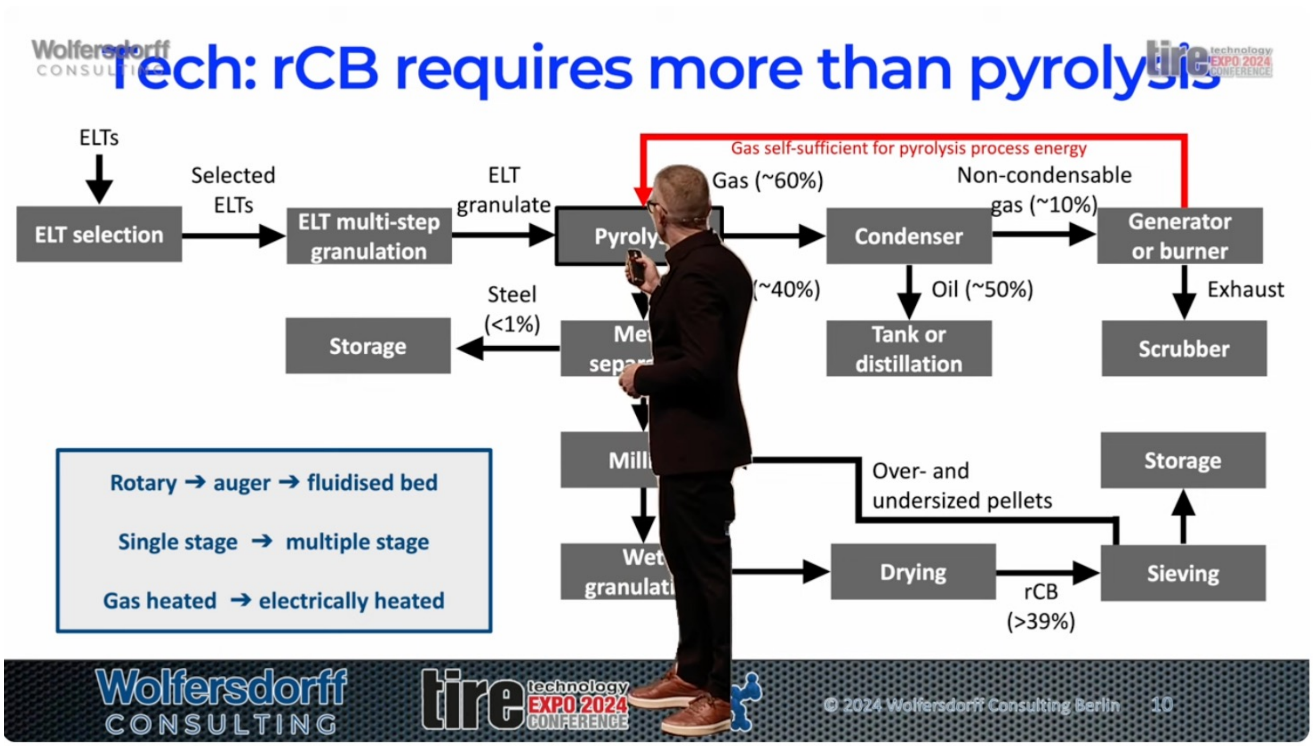
2. Silicon dioxide-based products

Silicon dioxide available in various forms (liquid, powdered) For example, these can be used in paints and varnishes, building materials, plastics, tires (tread) and semiconductors.

3. Zinc-based products

Powdered products for use in paints, semiconductors, pharmaceutical products, tires (vulcanization) and many other applications.

Recovered Carbon Black Talk 30 min



Tire Recycling

Environmental concerns [edit]

Due to their heavy metal and other pollutant content, tires pose a risk for the leaching of toxins into the groundwater when placed in wet soils. Research has shown that very little leaching occurs when shredded tires are used as light fill material; however, limitations have been put on use of this material; each site should be individually assessed determining if this product is appropriate for given conditions.[9]

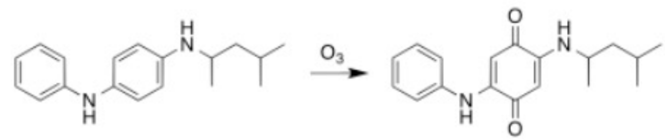
For both above and below water table applications, the preponderance of evidence shows that TDA (tire derived aggregate, or shredded tires) will not cause primary drinking water standards to be exceeded for metals. Moreover, TDA is unlikely to increase levels of metals with primary drinking water standards above naturally occurring background levels.[33]

What does ozone do to tires?

Anti-ozonant

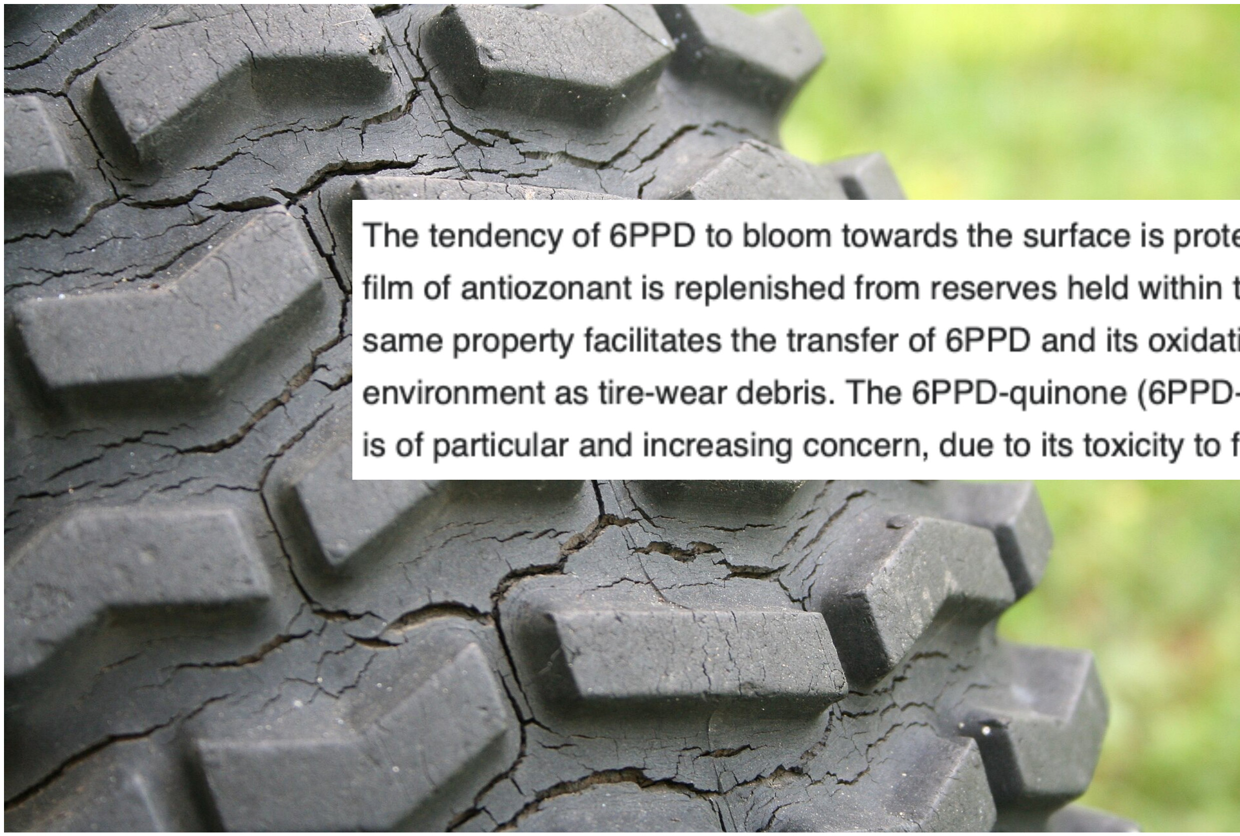
6PPD

6PPD-quinone



phenyl phenylenediamine (PPD)

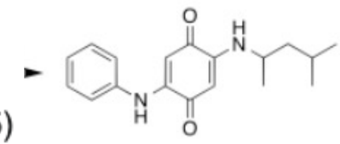
What does ozone do to tires?



The tendency of 6PPD to bloom towards the surface is protective because the surface film of antiozonant is replenished from reserves held within the rubber. However, this same property facilitates the transfer of 6PPD and its oxidation products into the environment as tire-wear debris. The 6PPD-quinone (6PPD-Q, CAS RN: 2754428-18-5) is of particular and increasing concern, due to its toxicity to fish.

Anti-ozonant

6PPD-quinone



phenyl phenylenediamine (PPD)

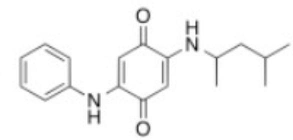
What does ozone do to tires?

Anti-ozonant

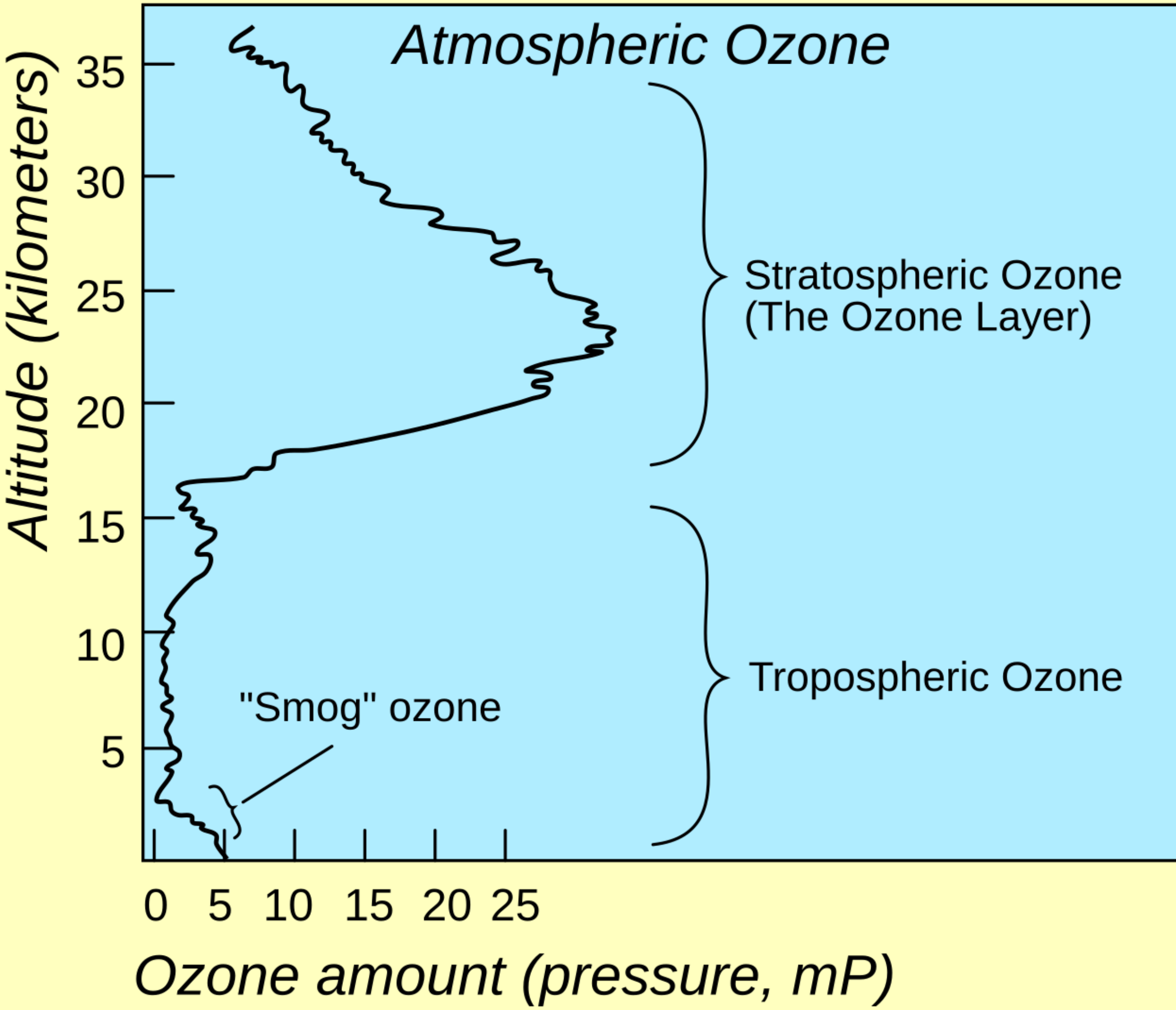
A 2022 study also identified the toxic impact on species like brook trout and rainbow trout.[17] The published lethal concentrations are:[17][18]

- coho salmon: LC_{50} = 0.095 µg/L
- brook trout: LC_{50} = 0.59 µg/L
- rainbow trout: LC_{50} = 1.0 µg/L

6PPD-quinone



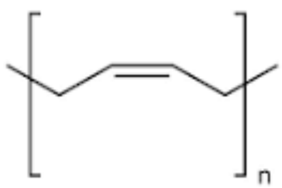
ediamine (PPD)



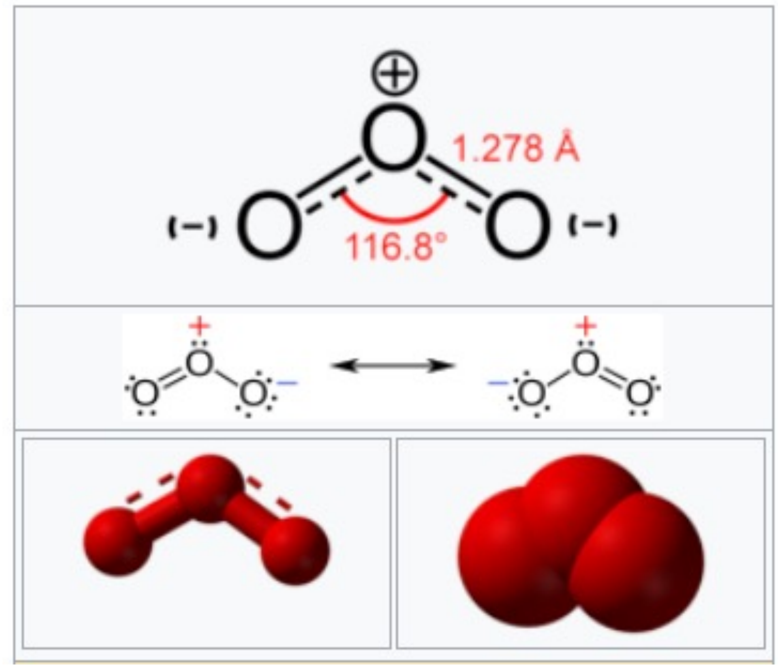
· Contains 90% of atmospheric ozone
· Beneficial role: acts as primary UV radiation shield
· Current issues: Long-term global downward trends and Springtime Antarctic ozone hole each year

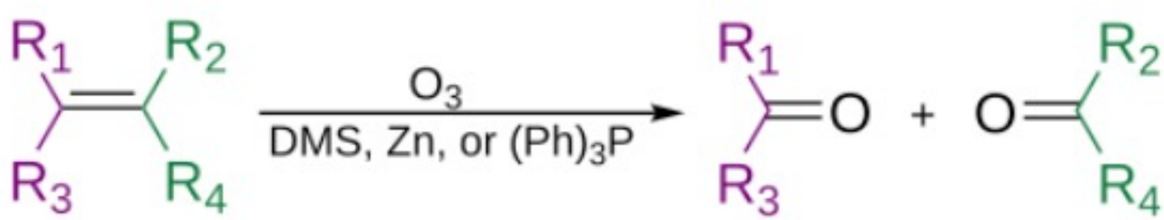
· Contains 10% of atmospheric ozone
· Harmful impact: Toxic effects on humans and vegetation
· Current issues: Episodes of high surface ozone in urban and rural areas

Polybutadiene has double bonds
That react with sulfur in vulcanization
But can also react with Ozone

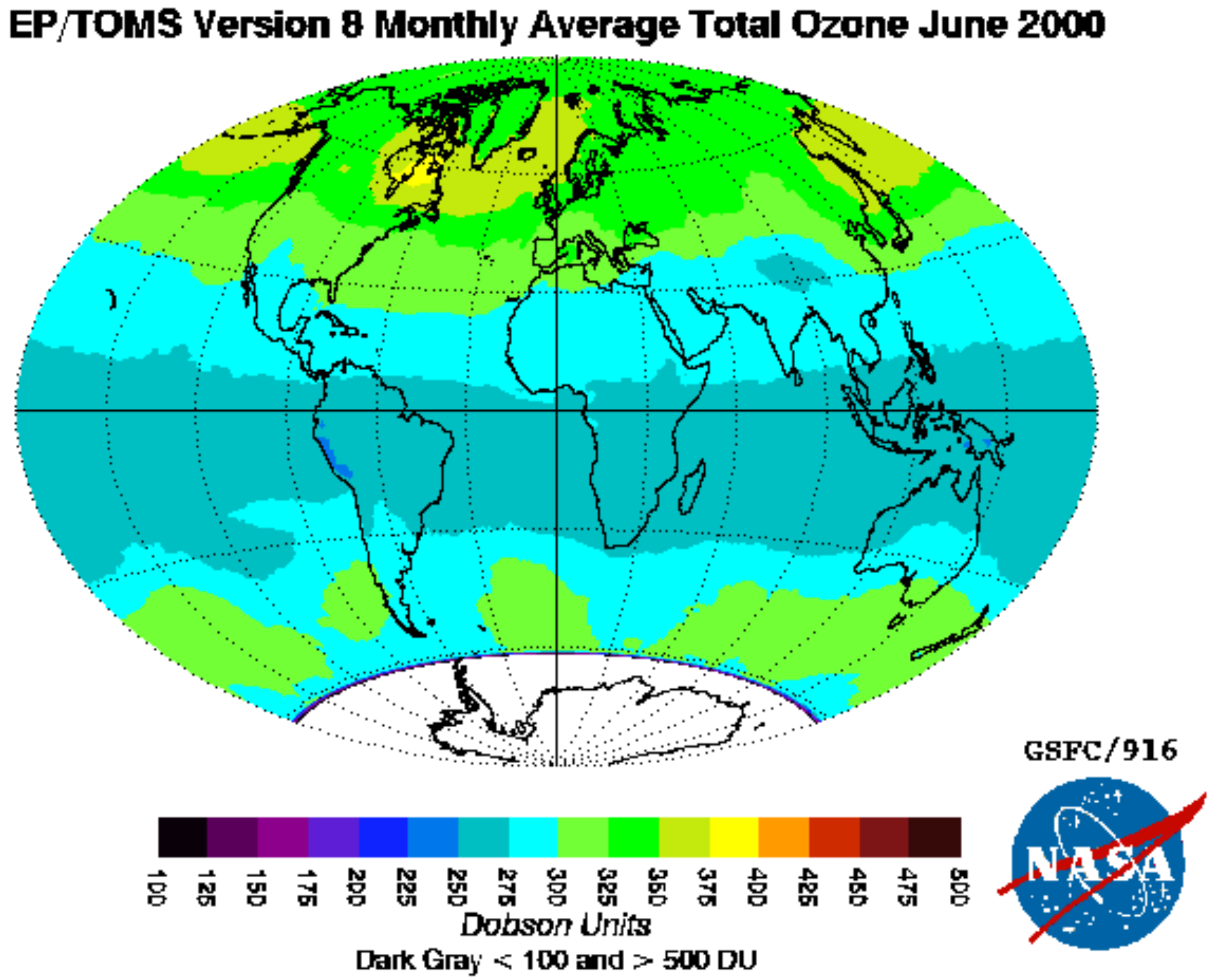


Ozone





Formed by UV light on O_2
Smells like chlorine


EP/TOMS Version 8 Monthly Average Total Ozone June 2000
GSFC/916
100
125
150
175
200
225
250
275
300
325
350
375
400
425
450
475
500
Dobson Units
Dark Gray < 100 and > 500 DU

Antiozonants

Protection of elastomers [edit]

Antiozonants are used as additives in tire manufacturing to retard the effects of ozone.[2]

The most common antiozonants for elastomers are *N,N′*-substituted *p*-phenylenediamines (PPD) which can be categorized in three types:

- Dialkyl *p*-Phenylenediamines, such as N,N'-Di-2-butyl-1,4-phenylenediamine
- Alkyl-aryl *p*-Phenylenediamines, such as 6PPD[3] or IPPD[4]
- Diaryl *p*-Phenylenediamines, like DPPD

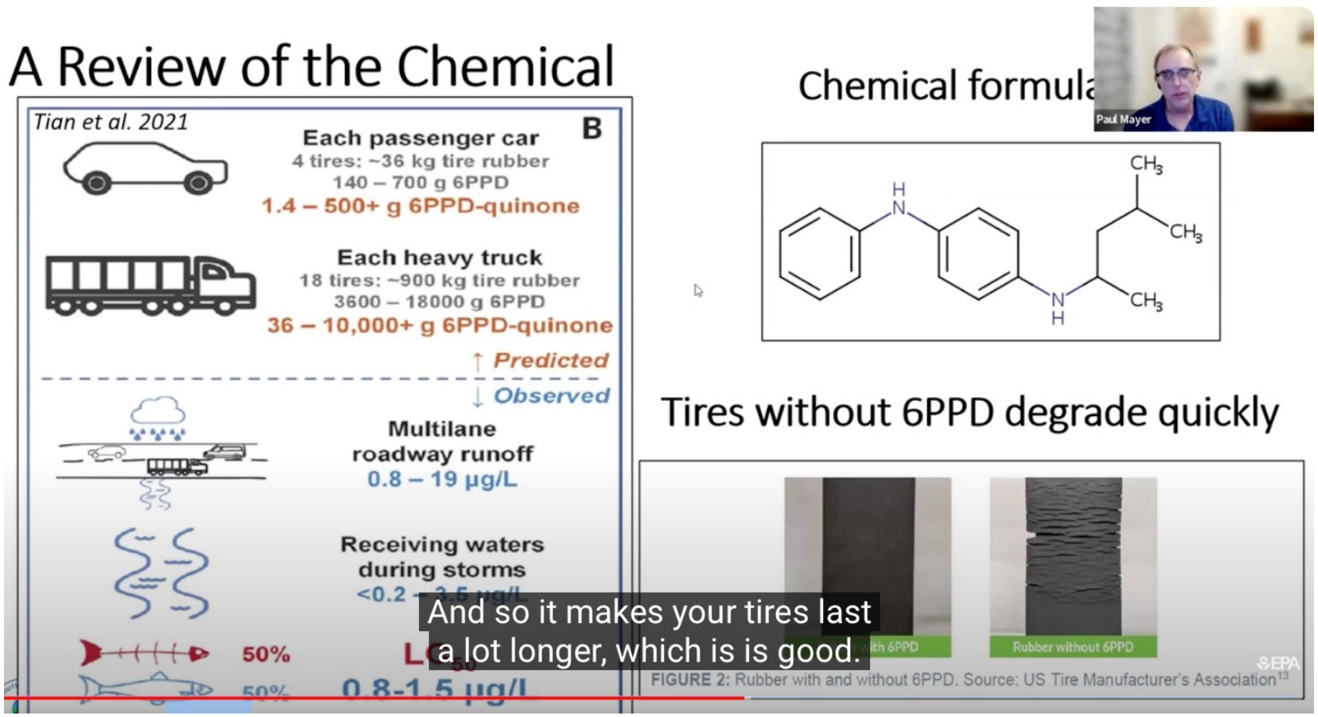
Other classes include:

- Styrenated phenol (SPH), styrenated and alkylated phenol (SAPH)
- Hydrocarbon waxes which create a surface barrier, preventing contact with ozone: paraffin wax, microcrystalline wax.[5]

Protection of plants [edit]

For the protection of plants like winter wheat[*citation needed*] or maize[6] Ethylene diurea (EDU) has been used successfully as antiozonant.

6PPD-q


A Review of the Chemical
Tian et al. 2021
B
Each passenger car
4 tires: ~36 kg tire rubber
140 – 700 g 6PPD
1.4 – 500+ g 6PPD-quinone
Each heavy truck
18 tires: ~900 kg tire rubber
3600 – 18000 g 6PPD
36 – 10,000+ g 6PPD-quinone
↑ Predicted
↓ Observed
Multilane roadway runoff
0.8 – 19 µg/L
Receiving waters during storms
50%
0.8-1.5 µg/L
Chemical formula
Paul Mayer
CH3
H N
CH3
N H
CH3
Tires without 6PPD degrade quickly
Rubber without 6PPD
FIGURE 2: Rubber with and without 6PPD. Source: US Tire Manufacturer's Association
EPA
And so it makes your tires last a lot longer, which is good.

Tire Recycling