

# 2022 Annual US Scrap Tire Workgroup Meeting

November 7, 2022

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**Brian Gaboriau,**  
Colorado Department of Public Health and Environment



Auto-generated closed captions available upon request

# Agenda

11:00 am - 11:10 am

Opening remarks / US Scrap Tire Workgroup overview

- **Brian Gaboriau**, Colorado DPHE, US Scrap Tire Workgroup Chairperson

11:10 am - 11:20 am

Goals Committee overview

- **Channon Cohen-Denson**, Ohio EPA, Goals Committee Chairperson

# Agenda cont.

11:20 am - 12:10 pm

## Committee updates

- **Nicholas Amante**, Calrecycle
- **Joaquin Wright**, GHD
- **Kole Kennedy**, Oklahoma DEQ
- **Lori Freeman**, Indiana Dept. of Environmental Management
- **Kirsten Clements**, Michigan Dept. of Environment, Great Lakes, and Energy

# Agenda cont.

12:10 pm - 12:30 pm

“2021 US Scrap Tire Management Summary”

- **John Sheerin, U.S. Tire Manufacturers**

12:30 pm - 12:45 pm

“Bolder Industries - a company profile”

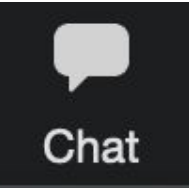
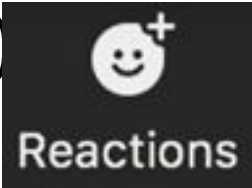
- **Nate Murphy, Bolder Industries**

12:45 pm - 1:00 pm

Q&A session - **Brian Gaboriau**

# Logistics

- Participation options - meetings:

- 1)  2)  hand”

- Phone participation:
  - Press \*9 to raise hand; Press \*6 to mute/unmute
- Presentations and meeting recording will be available at <http://stref.org/stwg>
- Mute microphone and turn off video when not speaking
- Optional: add affiliation to Zoom name

# Who We Are and What We Do

- A collaboration of states, industry, trade associations, academia and other interested parties who work cooperatively to address critical scrap tire issues facing the country.
- A forum to achieve progress in eliminating barriers to scrap tire markets, encourage expansion of those markets and encourage the prevention and abatement of stockpiles.
- A forum to provide technical exchange and to share best practices.

# Facts / Resources

- 124 workgroup members
- 48 of 50 states represented
- Workgroup website
  - <http://stref.org/stwg>
  - Website password: USSTW2022
  - Private website
  - Posting of surveys, minutes, presentations, etc.
  - Removed chat box feature
- Archives, mailing list, document control
- Emailing the group questions/answers. Use current list on website or contact me to distribute.
- We are a networking group!

# Committees

- Goals - Channon Cohen-Denson (OH)
- Civil Engineering - Joaquin Wright (CA)
- Ground Rubber - Nicholas Amante (CA)
- Rubber Modified Asphalt - Kirsten Clemens (MI)
- Tire Derived Fuel & Export - Kole Kennedy (OK)
- Enforcement - Lori Freeman (IN)



# Next Steps

- Future meetings / conference calls
- Initiatives:
  - Into The Outdoors documentary - done in early 2023
  - Scrap Tire Beneficial Use Information Sheets  
(Tire-derived Aggregate sheet now available on the website)

# Thank you!

Thank you for your continued support of the workgroup!

Brian Gaboriau

Colorado Department of Public Health and Environment

4300 Cherry Creek Drive South

Denver, CO 80246

303-692-2097

[brian.gaboriau@state.co.us](mailto:brian.gaboriau@state.co.us)



# **USSTW GOALS COMMITTEE UPDATE 2022**

Channon Cohen-Denson


# WHAT IS THE PURPOSE OF THE GOALS COMMITTEE?

- Provide leadership, strategic planning, and direction to the USSTW.
- Assist with the recruitment of new workgroup members.
- Work with individual workgroup committees on priorities, potential projects and deliverables
- Address issues brought forward by USSTW members.

# MEET THE GOALS COMMITTEE

- Channon Cohen-Denson, Ohio EPA
- Terry Gray, TAG Resource Recovery
- James Jennings, Illinois EPA
- Denise Kennedy, DK Enterprises
- Matt Lamb, Porous Pave Inc.
- Monte Niemi, First State Tire Recycling
- Rhonda Oyer, Michigan EGLE
- Mel Pins, IOWA DNR
- John Sheerin, USTMA
- Mary Sikora, Scrap Tire News
- Vacancy

# CREATE SCRAP TIRE BENEFICIAL USE INFORMATION SHEET



Scrap Tire Beneficial Use Information Sheet

## Tire-Derived Aggregate (TDA) Used as a Lightweight Fill Material

### Economic, Environmental and Social Assets

- May be cost effective:** When compared to other fill products used in construction, such as soil, gravel, or stone, TDA costs less for the same volume of product.
- Replace traditional or virgin material:** The use of TDA can replace traditional or virgin materials that are used as fill.
- Waste Diversion:** Turning tires into TDA diverts a solid waste from landfills.
- Repurposed:** Tires that are made into TDA are repurposed which is a more favorable outcome for a solid waste material on the waste management hierarchy.
- Sustainable Material:** For the foreseeable future, there is not a replacement for tires on vehicles. Therefore, scrap tires will always be available as a material. With this knowledge, the consideration of scrap tires as a sustainable material may factor into long-term solutions to global demands for finite virgin materials.





Image from US EPA

### TDA as Lightweight Fill in Civil Engineering Applications

As a lightweight fill material, TDA has been successfully utilized in the following civil engineering applications:

#### Highway/Road Embankment Development and Failure Repair

For these types of projects, TDA can be used as a strong, lightweight, and free draining material. In addition to being free draining and lightweight, TDA is stronger than many soils, often making TDA fill the best option.



Subgrade fill (typically soil) should be adequate to withstand the loads acting upon it by providing strength and support, drainage and frost protection and prevent settlement. When used to construct on weak and/or compressible foundation soils, TDA brings engineering benefits by reducing the chance of shear failure, and often increasing the factor of safety of the repair.


Settlement is an engineering challenge that must be considered in the design or repair of highway/road embankments and roadway transitions to a stationary surface. TDA can be used to limit settling by decreasing the weight of the fill, resulting in a significant advantage to engineers in both cost and construction of the project.

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October 2022

- Provides educational resources about common scrap tire technologies and applications
- Creates educational resources for Scrap Tire Workgroup members that includes list of subject matter experts, published research, applicable ASTMs and successful projects
- Creates templates that can be customized and published for a public entity's use
- Provides a peer-reviewed resource for public entity use
- Promotes scrap tire market development

# SCRAP TIRE BENEFICIAL USE INFORMATION SHEET FOR USSTW MEMBERS

 Scrap Tire Beneficial Use Information Sheet

## Fire-Derived Aggregate (TDA) Used as a Lightweight Fill Material

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 Scrap Tire Beneficial Use Information Sheet

## Subject Matter Experts Available as a Resource to USSTW Members

- Joaquin Wright, [Joaquin.Wright@ghd.com](mailto:Joaquin.Wright@ghd.com)
- Monte Niemi, [MonteMKN@firststatetire.com](mailto:MonteMKN@firststatetire.com)



## Publications

Please search the following websites to find pertinent TDA research:

- ASTMs, [Standards & Publications - Products & Services \(astm.org\)](https://www.astm.org)
- [Tire Engineering Research Center – California Pavement Preservation Center – Chico State \(csuchico.edu\)](https://www.csuchico.edu/tire-engineering-research-center)

## Completed Projects in the United States

An inventory of successfully completed projects can be found at the following websites:

- Please Ctrl + Click here [Tire Engineering Research Center – California Pavement Preservation Center – Chico State \(csuchico.edu\)](https://www.csuchico.edu/tire-engineering-research-center) Remember to use the guest login.
- [First State Tire Recycling & R-T.E.A. Manufacturing - Call Us for ALL Your Tire Recycling Needs at 763-434-0578](https://www.firststatetire.com)

# SCRAP TIRE BENEFICIAL USE INFORMATION SHEET FOR STATE AGENCY CUSTOMIZATION

**[place your Agency logo here]** Scrap Tire Beneficial Use Information Sheet

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Image from US EPA

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**[place your Agency logo here]** Scrap Tire Beneficial Use Information Sheet

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- [First State Tire Recycling & R-T.E.A. Manufacturing - Call Us for ALL Your Tire Recycling Needs at 763-434-0578](https://www.firststate.com)

**[Unlocked sections of this sheet include**

- the header where state agency logos can be placed
- all pictures can be replaced with projects from your state
- please consider customizing this section of the sheet by placing state information such as contact people, grant programs, other state resources, etc.

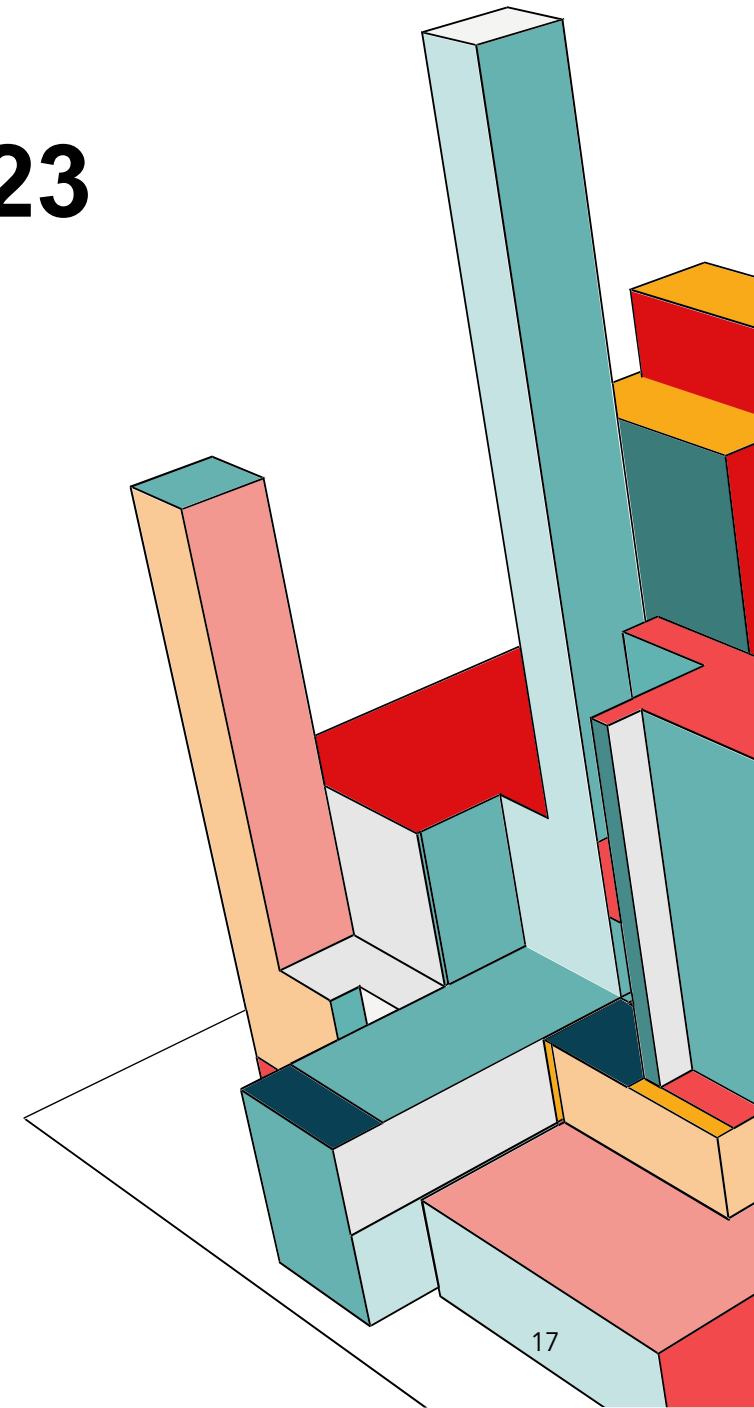
**]**

Please do not place additional information in the locked portions of this sheet. To remove locked information, the password is USSTW.



# USSTW GOALS COMMITTEE - 2023

- Engagement with US EPA
- Identify Opportunities for State Programs to Benefit from US Legislative Initiatives



# ENGAGEMENT WITH US EPA

EPA's Web Archive: This content is not maintained and may no longer apply.  
For current information, click on the EPA logo to visit epa.gov.

U.S. ENVIRONMENTAL PROTECTION AGENCY



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

You are here: [EPA Home](#) » [Wastes](#) » [Resource Conservation](#) » [Common Wastes & Materials](#) » [Scrap Tires](#) » Basic Information

### 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 US 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

Scrap tires are used in a number of 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 three largest scrap tire markets are:



*"Over 75% of scrap tires are recycled or are beneficially used for fuel"*

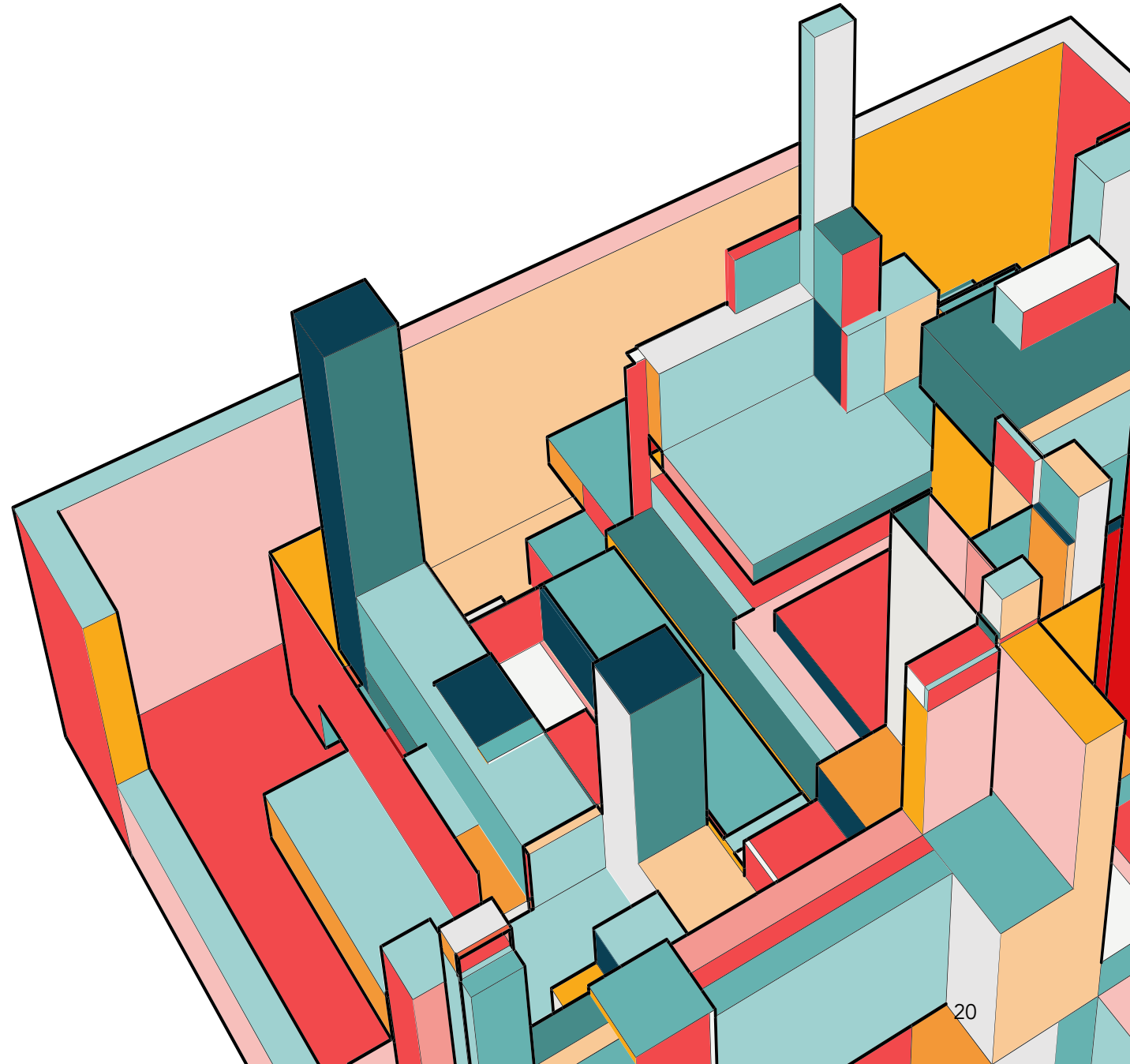
- Wastes Home
- Resource Conservation Home
- Common Wastes and Materials Home
- Scrap Tires Home
- Where You Live
- Basic Information
- Markets
- Laws/Statutes
- Grants/Funding
- Science/Technology
- Publications
- Scrap Tire Workgroup
- Information Resources
- Laws & Regulations
- Educational Materials
- Planet Protectors for Kids logo

# ENGAGEMENT WITH US EPA

- Find a liaison between USSTW and USEPA
- Request that a member of USEPA join USSTW
- Provide information for USEPA Initiatives by surveying USSTW
- Examine available federal scrap tire data collection and the prospect of a national portal for comprehensive, consistent scrap tire data collection

# IDENTIFY OPPORTUNITIES FOR STATE PROGRAMS TO BENEFIT FROM US LEGISLATIVE INITIATIVES

- Infrastructure and Investment Jobs Act
- Inflation Reduction Act



# GOALS COMMITTEE

Please feel free to contact me at

Channon Cohen-Denson

[channon.cohen@epa.ohio.gov](mailto:channon.cohen@epa.ohio.gov)

614-728-5353



# US Scrap Tire Workgroup 2022 Annual Meeting

Hosted by the Colorado Department of Public Health & Environment

November 7, 2022

Ground Rubber Committee



**COLORADO**  
Department of Public  
Health & Environment

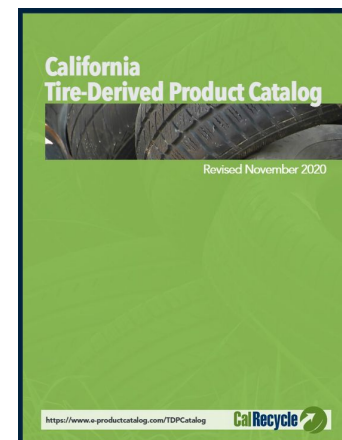
## Uses for Ground/Crumb Rubber

- Molded and other tire-derived products
- Rubberized pavement
- Synthetic turf infill
- Playgrounds (loose fill, poured-in-place and tiles)



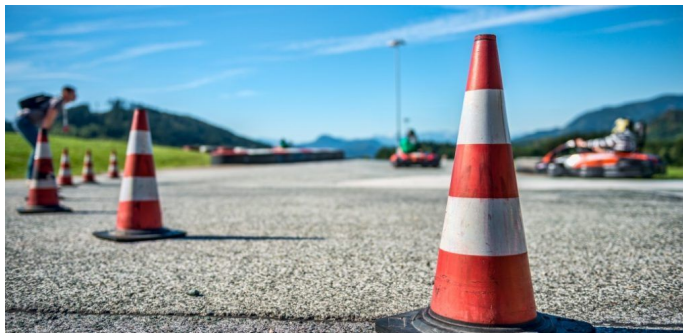
# California Tire Derived Product (TDP) Catalog

- Online, interactive catalog
  - Designed to bring awareness about broad range of products made from recycled tires
  - <https://www.e-productcatalog.com/TDPCatalog/>





# Tire-Derived Product Examples



**COLORADO**  
Department of Public  
Health & Environment

# What's Happening?

- Current Market
  - Still experiencing post-pandemic challenges
    - Transportation challenges
    - Workforce challenges
  - First time, USTMA report shows that crumb rubber has beat out TDF by slim margin
  - Molded/Extruded market are largest users



# Ground Rubber Committee Members

**Nicholas Amante**, State of California

**Amy Brackin**, Liberty Tire Recycling

**Lisa Evans**, State of Kentucky

**Bob Fletcher**, State of Tennessee

**Alle Crampton**, State of Tennessee

**Terry Gray**, TAG Resource Recovery

**Everette Hatcher**, State of Arkansas

**Denise Kennedy**, DK Enterprises

**Dexter Mathews**, Liberty Tire Recycling

**Bill Robbins**, Rubberform Recycled Products

**John Sheerin**, US Tire Manufacturers

Association

**Mary Sikora**, Recycling Research Institute/

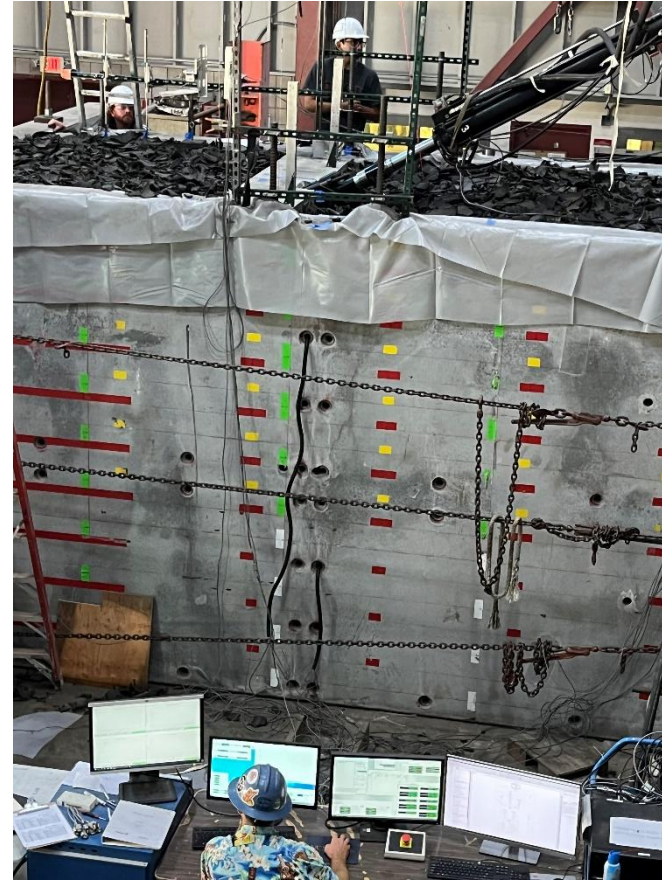
Scrap Tire News



# US Scrap Tire Work Group, Civil Engineering Committee Update

PRESENTED BY: Joaquin Wright, GHD Inc.

11/07/22



# US STWG Civil Engineering Committee

## 2022-2023 Objectives

- Maintain forum for open-source sharing of Civil Engineering application information using End of Life Tires(ELTs)
  - Share research and projects among state decision makers involved with ELTs, Tire Derived Aggregate(TDA) and Civil Engineering
- Help to develop public access information for the United States ELT Civil engineering market.
  - Develop public awareness documents about civil uses for ELTs
    - Tire Derived Aggregate (TDA) projects
    - Share public access information centers, and populate them with national examples of ELTs in Civil projects



# **US STWG Civil Engineering Committee**

## **list of currently utilized civil applications**

**Boat or Ship bumpers**

**Highway Crash Barriers**

**Bales for windbreaks**

**Mechanically Stabilized TDA walls (MSTDA)**

**TDA fill behind Cast in place and Soldier Pile walls**

**Lightweight fill and/or insulating layer for road, subgrade**

**Slope and Bank stabilization, Whole tires and TDA (strength and drainage)**

**Fill material for water storage, retention, and infiltration**

**Wastewater treatment media, private and public systems**

**Vibration mitigation layer (light rail lines)**

**Chemical sorption for Storm Water constituents of concern mitigation**

**Compressible layer behind foundations and general Abutments**

**TDA above and below pipes to reduce strain and/or deflection**

**TDA in Landfill Applications, Alternative daily cover, LCRS systems, etc.**

*More civil applications that have historically been applied in the US can be found at,  
Scrap Tire Research and Education Foundation  
at [Stref.org/tire-uses](http://Stref.org/tire-uses)*





# Design for **IMPROVED SAFETY FACTOR**, **COST SAVINGS** with **TIRE-DERIVED AGGREGATE**

- Low unit weight **applies smaller vertical stress** than conventional backfill
- **Lower settlement and increased stability**
- **Reduces lateral earth pressure** to 50% of conventional backfill
- **Increases the safety factor** of bridge abutments and retaining walls by reducing the lateral load and hydraulic load for civil engineering designs.

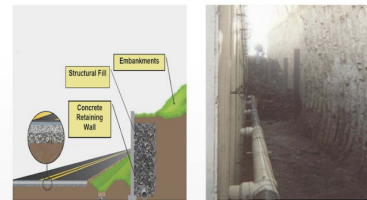


...TDA has been successfully used in embankments, bridge abutments, subgrade insulation for roads.



ASCE LIBRARY

**“TDA can reduce lateral load and pressures twice more than conventional aggregate, in backfilling walls, bridge abutments.”** (Tweedie et al. 1998)



**HIGH VALUE SUSTAINABLE SOLUTIONS**  
Scan the QR code now to find out more.



## California Pavement Preservation Center

CP2C | TIRE ENGINEERING RESEARCH CENTER

California Pavement Preservation Center

Tire Engineering Research Center

### Tire Engineering Research Center

TTC's TDA Project Database for CalRecycle [↗](#)

Introduction of TDA

TDA Training Module: Introduction

TDA Brochure

TDA Environmental Testing and Earthquake Safety

TDA Low Cost Vibration Mitigation

About Us +

Pavement Preservation Task Group +

Innovation Database

Pavement Preservation Treatment Database (PPTDB)

Strategy Selection Program

Educational Opportunities +

Resources & Partnerships

CP2C Newsletters

Library +

Links

Civil Engineering +

Contact Information

### Our Office [📍](#)

Langdon, Room 203

[530-898-5114](tel:530-898-5114)

### Regular Hours

8 a.m.–5 p.m.

Monday–Friday

### Mailing Address

California Pavement Preservation Center

400 W. First St.

Chico, CA 95929–0603



# Tire Engineering Research Center

California's Department of Resources Recycling and Recovery (CalRecycle) established the Tire Derived Aggregate Technology Center (TTC) at the California State University, Chico on March 1, 2012. Since then, the TTC has provided many services to CalRecycle and its partners.

The purpose of TTC is to assist CalRecycle in increasing the use of TDA in civil engineering applications. Through the Center, the California State University, Chico Research Foundation shall provide support to both private and public engineers to gain acceptance of TDA as a viable civil engineering construction material and thereby create more opportunities for TDA projects.

The material testing services aspect of the TTC will support CalRecycle and local agencies by investigating and testing the engineering properties of TDA and rubberized asphalt concrete (RAC) that are necessary to ensure the performance of these materials in civil engineering applications.

## Mission Statement

The Center has two major missions: one is to provide technical support to the State, local agencies, and professionals on how to use TDA in their projects; the other one is to develop educational materials for university education on using TDA in civil engineering applications.

## TDA Projects Database

You can click on [TDA Database](#) [↗](#) to access some major TDA projects, which have been built in California.

## TDA Training Videos

You can click on [video link](#) to view an introduction to TDA.

You can click on [video link](#) to view TDA - A Sustainable Road Repair Solution.

You can click on [video link](#) to view TDA Environmental Testing and Earthquake Safety.

You can click on [video link](#) to view TDA as a low-cost vibration mitigation material.

## TDA Online Training Program

CalRecycle and TTC have developed a [TDA Online Training Program](#) [↗](#).

## TDA Resources

You can click on [Grant](#) [↗](#) page link to view the latest CalRecycle's TDA grant program.

You can click on [CalRecycle](#) [↗](#) TDA information page link to view information about CalRecycle's TDA program.

You can click on [TDA Brochure](#) to view the latest CalRecycle's TDA Brochure.

You can click on this [report link \(PDF\)](#) to view a Mechanically Stabilized TDA summary and design guide.





# TIRE DERIVED AGGREGATE PROJECT DATABASE



[Search TDA Projects](#)



[TDA Projects](#)





# TIRE DERIVED AGGREGATE PROJECT DATABASE



[Search TDA Projects](#)



[TDA Projects](#)

Map | Satellite

Vendors

United States

Mexico

Guatemala

Cuba

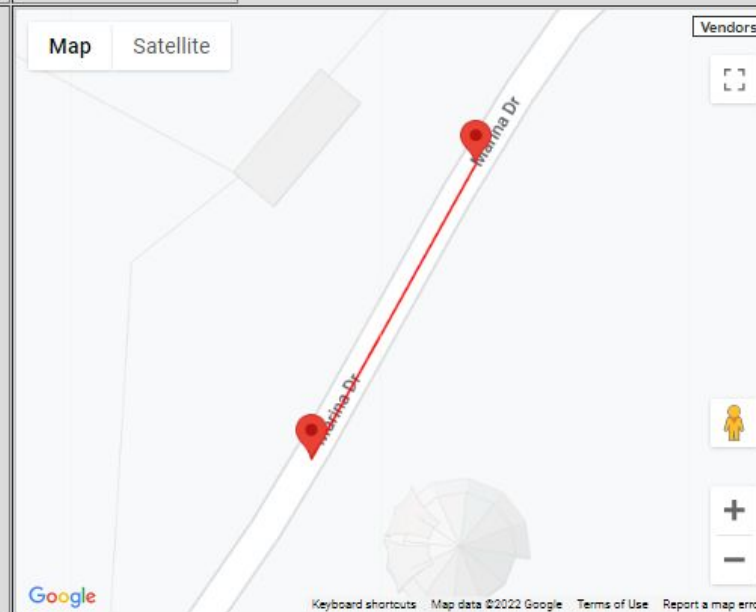
Puerto Rico

Google

Keyboard shortcuts | Map data ©2022 Google, INEGI | Terms of Use

## View TDA Project

Type of TDA	Landslide Repair	Project Title ⓘ	Marina Drive Landslide Repair
Is it an Experimental Feature?	No	District	1
Project Status	Completed		
City	Calpella	Country	
Start Construction Date	08-20-2007	End Construction Date	11-02-2007
Project Input Date	06-12 00:00:00-2012		
Project Locations	site-1 39.234734,-123.1843559 39.23524091671426,-123.18399111957399		
Number of tires	133,000		
Total Cost of Project	740,000		

[Click to Show on Map](#)

# US STWG Civil Engineering Committee

- Forum for sharing of Civil Engineering applications using End of Life Tires(ELTs)
- Help to develop public access information for the United States ELT Civil engineering community.
- **Meeting Schedule 2022 – 2023, December 5<sup>th</sup>, 2022, April 3<sup>rd</sup>, August 7<sup>th</sup>, December 4<sup>th</sup>, 2023**
  - (First Monday of the respective months) 8:30 am -9:30am PST



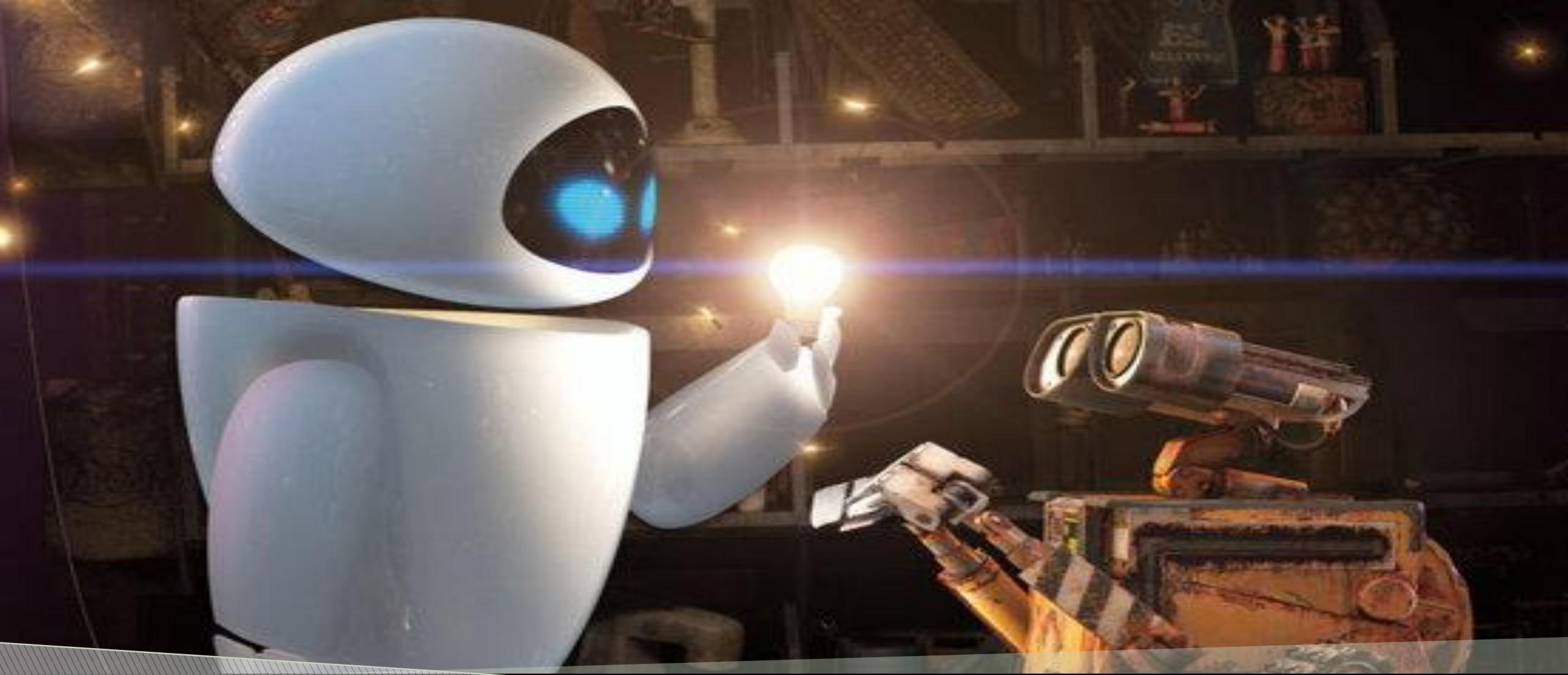
Introduction of TDA – California Pavement Preservation Center – CSU, Chico  
([csuchico.edu](http://csuchico.edu))



**Please contact me with any questions you may have.**

**Joaquin Wright, Sustainable Resource Engineer, TDA specialist**  
**[Joaquin.wright@ghd.com](mailto:Joaquin.wright@ghd.com), 707 303 4850**





# **TDF and Export Subcommittee**

**US Scrap Tire Workgroup Meeting**

**NO CALLS THIS YEAR.**



**SADNESS!**

**BUT WE STILL GET TO TALK**

**TIRES!**



**HAPPINESS!**



# TARGETED A PROJECT



# Subcommittee Project

What a new user needs to know about TDF:

- So you are considering using Tire Derived Fuel (TDF). TDF is a high BTU, low cost, sustainable alternative fuel. It has low air emissions and a long history of use. It does require coordination with state environmental agencies on permitting, and feeding logistics are important, but the economics often make it well worth your while.

# GOALS OF THE COMMITTEE

- Finalize the outline.
- Start filling in the details.
- Polish up the document.



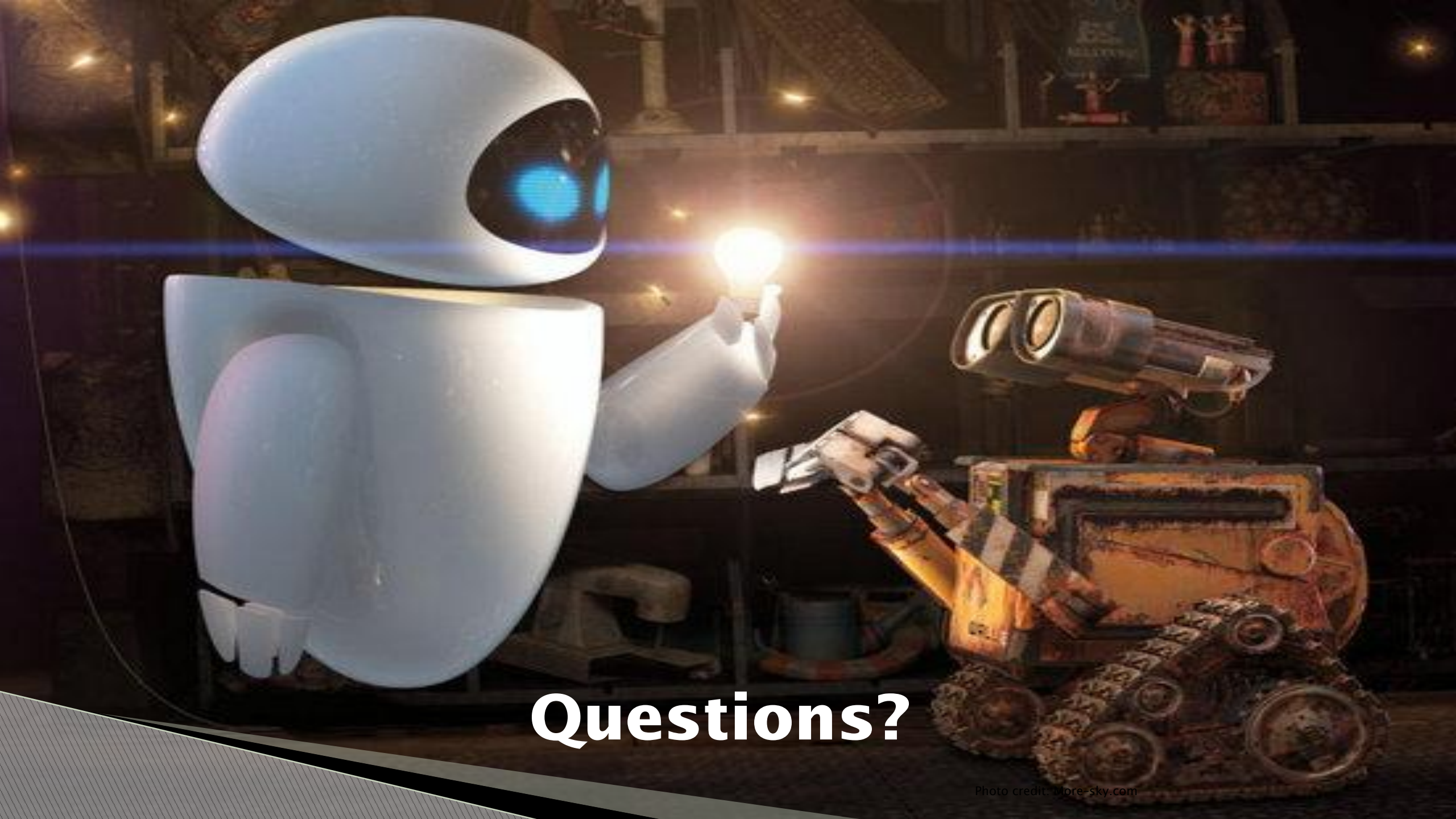
# New Chairperson?

- Do you love tires?
- Want to lead an AWESOME group?
- Reach out to Brian and/or myself for all the details.



Go Pokes!!! 🤗





**Questions?**

# Contact Information

Kole Kennedy  
405-702-5177

[Kole.kennedy@deg.ok.gov](mailto:Kole.kennedy@deg.ok.gov)





# **U.S. Scrap Tire Workgroup Meeting**

## Enforcement Committee Report

Nov. 7, 2022

**Lori Freeman**

Compliance Branch Chief

IDEM, Office of Land Quality





# Enforcement Committee

## Members:

- Shana Baker – CO DPHE
- Dexter Matthews – Liberty Tire Recycling
- Tara Grazier – DE DNREC
- Alex Clark – MI DEQ
- Dan Werner – WI DNR
- Jessica Price – SC DHEC
- John Sheerin – USTMA
- Scott Zajac – MI DEQ
- Lori Freeman – IDEM



# Committee Goal

To assist states with their enforcement/compliance issues by developing general BMPs/educational campaigns that can be modified and used by individual states.



# Committee Project

New project for 2021-2022: Anti-dumping awareness campaign

**Goal:** Provide states with post cards covering a variety of topics to assist in compliance efforts.

- Post cards should be editable and provide convenient locations for states to add appropriate citations.
- Post cards should be general to better enable them to be used by a variety of states.



# Potential Post Card Topics

- “Where are your tires going? – does your state require the use of registered/permitted facilities?”
- Number of tires requiring a registration/permit
- Definition of open dumping
- Fire hazards
- Vector attractants



# Where are your tires going?

## Where are your tires going?

- **Waste tires are** Select or type choice. **in landfills in** Type state name here. (Type citation).
- **Waste tires** Select or type choice. **transported by** Select or type choice (Type citation).
- **Waste tires** Select or type choice. **be taken to** List types of facilities. (Insert citation).
- **You must have a** Select or type choice. **if you** Select or type choice **waste/scrap tires in** Type state name (Insert citation).
  - **Financial assurance may be a requirement** (see above citation to determine if it is necessary for your type of facility).

Questions concerning waste/scrap tires can be directed to: Insert contact info.





## Post card content

- The content in the boxes include the option select from a drop down list and/or type a more specific choice.
- Drop down choices were selected from the survey the enforcement committee completed in 2020



# Contact Information

Lori Freeman

*Compliance Branch Chief*

Office of Land Quality

Indiana Department of Environmental Management

(317) 232-8857

[lfreeman@idem.IN.gov](mailto:lfreeman@idem.IN.gov)



# Rubber Modified Asphalt

Subcommittee

Kirsten Clemens, Ashley Jenkins, BJ Bland, Blake Nelson, Dexter Matthews, Kirk Mitchell, Mark Belshe, Matthew Chandler



Part I:

# Upcoming Michigan RMA Study

Partners:

Resource Recycling Systems

Lawrence Technological University

Michigan State University

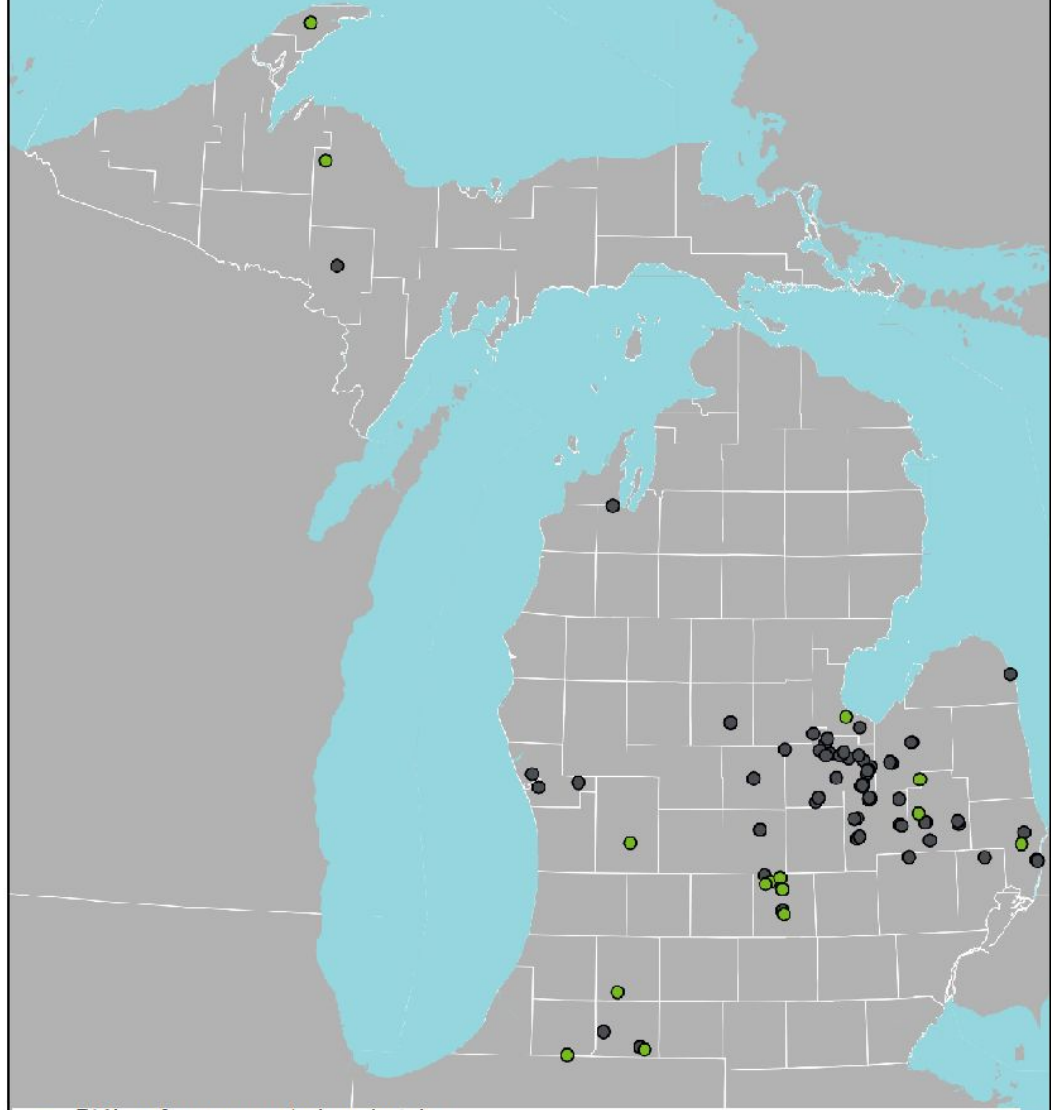
Michigan Technological University

# The Problem

- Laboratory studies have shown that carefully adding scrap tire rubber and nylon fiber can improve flexible pavement performance in the field.
- The pavement performance predictions show that adding rubber could improve the ride quality, fatigue cracking, and rutting performance compared with conventional hot-mix asphalt (HMA).
- The applications of rubber paving materials have met with various degrees of success.
- The failures result from inexperience with crumb rubber technology in project selection, design engineering, and construction decisions.
- The overarching research indicates that rubber-modified asphalt extends pavement life.
- Several factors, including construction, mix design, environment, and RMA technology, can impact pavement performance.



### Michigan EGLE Scrap Tire Program Rubber Modified Asphalt (RMA) Projects (2012 - 2022)



● RMA performance analysis project sites

● All RMA project sites

Note: some project locations have more than one type of RMA pavement. Data provided by EGLE

# Objectives

This study aims to summarize the RMA's historical performance in Michigan. It evaluates pavement performance, cost per ton, traffic volumes, aggregate types, construction types, and different RMA technologies for about 40 test sections constructed between 2012 and 2019.

Specific objectives are to:

- Develop RMA performance evaluation criteria and approach
- Provide technical assistance in classifying the portfolio of RMA projects
- Support the analysis of lessons learned, success factors, and executive summary for EGLE



# Recommendations

- RMA technologies are viable options for rehabilitation and reconstructed pavements.
- The use of rubber in chip seals is cost-effective and can make it a suitable maintenance option for low-volume roads.
- Inconsistency of RAP aggregates can cause variable RMA performance; however, the use of RAP can be more cost-effective.
- Overall, the pavement section with RMA performed slightly better than the control sections; however, the results are not statistically significant.
- Also, the RMA can cost 10% more than the traditional HMA, and conducting a life cycle assessment (LCA) to justify such technologies from a sustainability and environmental benefits perspective.
- The LCA results can produce Environmental Products Declaration (EPD) by reporting multiple ecological impacts.



# Results — Satisfaction Survey

- The majority (67%) of respondents did not identify any construction-related issue and did not make extra efforts to achieve densities for the RMA test sections.
- Most (78%) users believe that RMA costs are 10% higher than HMA materials, while 11% think that prices are comparable between RMA and HMA materials.
- The majority (84%) think RMA performance is better or similar to HMA materials. Only 17% believe that RMA performs worse than HMA materials.
- Also, most stakeholders (84%) think RMA needs less or similar maintenance to HMA layers.
- The majority (95%) of agency staff showed a willingness to use RMA technology.
- The majority believes that state funding is required to facilitate the use and implementation of RMA technology in Michigan.



# Part II: Moving to Markets

Challenges and Possibilities

# **Michigan's Model - Grass Roots...**

## **Flip the pyramid – we stopped starting at the top.**

- Michigan started talking to grantees that had previously installed RMA projects.
- Most organizations are looking for solutions to maintain their road infrastructure and are willing to think outside the box.
- Their successes start making other agencies take notice.



# Teamwork makes the Dream work

- For the future  Assemble a Dream Team and work together!
  - Rubber Processors that are heavily involved in providing material for RMA
  - RMA Technology producers (terminal blend, dry & wet process, chip seal)
  - University Partners
  - NCAT/RRRA
  - USTMA/USSTWG
- Provide information to state DOTs, USDOT & FHWA
  - Show them our many successes!
  - Get them involved.

# NEEDS

- **NEEDED: Electronic scrap tire manifesting system** (similar to the uniform hazardous waste manifest). Knowing where the tires are coming from and going to is valuable information.
- **NEEDED: Website to share RMA/RMCS technology.** Sharing data would lead to adoption.
- **CHALLENGES?** These are difficult to fund on a state-by-state basis. Where can we get the money/staff for these two items.

# 100 Miles of Rubber Modified Chip Seal

Video produced by Entech and RRS with EGLE support.

A special thank you to our County Road Commission partners for allowing us to demonstrate this material on their public roads.

- <https://drive.google.com/file/d/1cqMKHPgSE2dhXddegr803Aw8XKe5ZyMT/view>

# Acronyms Used in this presentation

- NCAT [Test Track at Auburn University](#)
- NRRA [Test Track at Minnesota DOT](#)
- RMA Rubber Modified Asphalt
- RMCS Rubber Modified Chip Seal
- TDA Tire Derived Aggregate
- USTMA US Tire Manufacturers Association
- USSTWG US Scrap Tire Workgroup



**2021 US Scrap Tire Management Summary**  
**November, 2022**

# About the U.S. Tire Manufacturers Association

The U.S. Tire Manufacturers Association (USTMA) is the national trade association for tire manufacturers that produce tires in the U.S. U.S. tire manufacturing has an annual economic footprint of \$170.6 billion and is responsible for more than 291,000 U.S. jobs in manufacturing, distribution and retailing. The industry supports more than 510,000 additional U.S. jobs in supplier and induced activities, totaling more than 801,000 jobs nationwide. USTMA advances a sustainable tire manufacturing industry through thought leadership and a commitment to science-based public policy advocacy. Our member company tires make mobility possible. USTMA began its scrap tire program in 1990 under the auspices of the Scrap Tire Management Council. USTMA works with all stakeholders, including states, U.S. EPA and the industry to develop markets, reduce scrap tire stockpiles and implement state regulations that that foster sustainable scrap tire markets. USTMA supports sustainable and circular scrap tire markets.

The logo for Bridgestone, featuring the word "BRIDGESTONE" in a bold, italicized, black sans-serif font.The logo for Continental, featuring the word "Continental" in a blue, rounded sans-serif font with a small circular icon to the right.The logo for Giti, featuring the word "Giti" in a bold, black sans-serif font next to a yellow square containing a black silhouette of a horse's head.The logo for Goodyear, featuring the words "GOODYEAR" in a bold, yellow, italicized sans-serif font with a lightning bolt symbol, and the tagline "MORE DRIVEN" in a smaller, black sans-serif font below it.The logo for Hankook, featuring a stylized orange and black graphic to the left of the word "HANKOOK" in a bold, black sans-serif font, with the tagline "driving emotion" in a smaller, black sans-serif font below it.The logo for Kumho Tire, featuring the words "KUMHO TIRE" in a bold, black sans-serif font with a red arrow pointing upwards to the right, and the tagline "Better. All-ways" in a smaller, black sans-serif font below it.The logo for Michelin, featuring a stylized white Michelin Man character above the word "MICHELIN" in a bold, blue sans-serif font, with the tagline "A BETTER WAY FORWARD" in a smaller, black sans-serif font below it.The logo for Nokian Tyres, featuring the words "nokian" and "TYRES" in a bold, white sans-serif font on a black rectangular background.The logo for Pirelli, featuring the word "PIRELLI" in a bold, red sans-serif font on a yellow rectangular background.The logo for Sumitomo Rubber Industries, featuring a blue diamond-shaped graphic to the left of the words "SUMITOMO" and "RUBBER INDUSTRIES" in a bold, black sans-serif font.The logo for Toyo Tires, featuring the words "TOYO TIRES" in a bold, blue sans-serif font with the tagline "driven to perform" in a smaller, black sans-serif font below it.The logo for Yokohama, featuring a stylized red and black graphic to the left of the word "YOKOHAMA" in a bold, black sans-serif font.

# USTMA Sustainability Vision

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- USTMA members share a common vision on sustainability which includes: Promoting tire safety; advancing worker safety; reducing greenhouse gas emissions throughout a tire's useful life; improving environmental footprints over time; minimizing the health, and environmental impacts of tire materials; and ensuring scrap tires enter sustainable markets.
- Specifically, ***USTMA members have the goal that all scrap tires enter sustainable and circular end use markets.***
- USTMA's 2021 scrap tire market summary report measures our progress towards meeting our sustainability vision.

# US Scrap Tire Generation 2021

Tire Class	Millions of Tires	Market %	Average Weight (lbs)	Weight (thousands of tons)
<b>Light Duty Tires</b>	<b>276</b>	<b>87.6%</b>	<b>25.0</b>	<b>3,454</b>
Passenger tire replacements	225	71.3%		
Light truck tire replacements	39	12.2%		
Tires from scrapped vehicles	13	4.1%		
<b>Commercial Tires</b>	<b>39</b>	<b>12.4%</b>	<b>120.0</b>	<b>2,342</b>
Medium, wide base, heavy truck replacement tires	23	7.3%		
Tires from scrapped trucks and buses	16	5.1%		
<b>Total tires hauled</b>	<b>315</b>	<b>100.0%</b>	<b>36.8</b>	<b>5,796</b>
<b>Used tires culled</b>	<b>42</b>	<b>13.2%</b>	<b>36.8</b>	<b>765</b>
<b>Net scrap tires</b>	<b>274</b>			<b>5,031</b>

<sup>2</sup> Earlier USTMA Scrap Tire Management Summary reports used Ward's Motor Vehicle Facts and Figures, scrapped vehicle data to calculate the number of scrapped vehicles. Ward's discontinued publishing this data in 2014 creating the need for a new approach. For the 2019 Scrap Tire Management Summary report, USTMA utilized the ratio of vehicles scrapped to vehicles sold for years 2000-2014 and applied that ratio to 2019 vehicle sales to produce the number of scrapped vehicles. USTMA estimated the split between cars and trucks/buses based on the average of split from Wards for 2002 -2012. This data assumes 2 tires scrapped from light duty vehicles and 2.5 tires scrapped from trucks and buses. Source of vehicle scrapped data, US DOT Bureau of Automotive Statistics, Table 4-58: Motor Vehicles Scrapped (May 21, 2017) [https://www.bts.gov/archive/publications/national\\_transportation\\_statistics/table\\_04\\_58](https://www.bts.gov/archive/publications/national_transportation_statistics/table_04_58). Source of vehicle retail sales in the United States from 1978 to 2019 data, Wards Motor Vehicle Facts and Figures .



# U.S. Scrap Tire Disposition 2021

Market or Disposition	Thousands of Tons	Millions of Tires	% change 2019 - 2021
Tire-Derived Fuel	1,394	76	-15.4%
Cement Kilns	682	37	-16.4%
Paper & Pulp	524	29	8.8%
Electric Utilities	187	10	-46.3%
Ground Rubber	1,407	77	29.2%
Civil Engineering	276	15	22.2%
Exported	87	5	-36.7%
Electric Arc Furnace	61	3	0.0%
Reclamation Projects	48	3	18.8%
Agricultural	0	0	-100.0%
Baled Tires/ Market	0	0	-100.0%
Punched/ Stamped	0	0	-100.0%
Other	306	17	121.1%
Total to Market	3,579	195	5.9%
Generated	5,031	274	12.7%
% to Market/ Utilized	71%	71%	-6.0%
Land Disposed	733	40	7.7%
<b>% Managed (includes Market, Baled, and Landfill)</b>	<b>86%</b>	<b>86%</b>	<b>-5.8%</b>

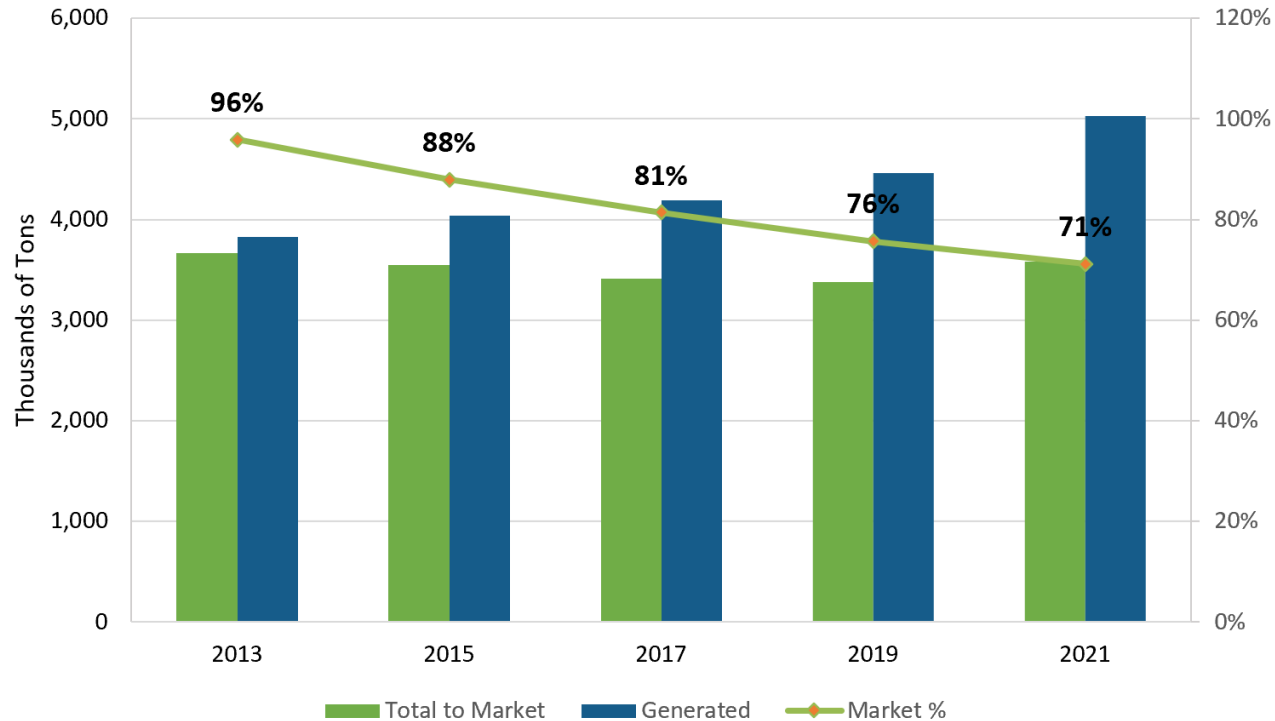
# U.S. Scrap Tire Market Summary 2013 – 2021

Market or Disposition (thousands of tons)	2013	2015	2017	2019	2021
Tire Derived Fuel	2,120	1,923	1,736	1,647	1,394
Ground Rubber	975	1,021	1,013	1,089	1,407
Land Disposed	328	451	647	680	733
Civil Engineering	172	275	316	226	276
Exported	246	102	110	138	87
Reclamation Projects	49	53	44	40	48
Electric Arc Furnace	66	26	39	61	61
Baled Tires/ Market	30	9	15	10	0
Punched/ Stamped	2	41	23	10	0
Agricultural	7	7	7	20	0
Other	0	95	108	138	306
Total to Market	3,667	3,551	3,411	3,379	3,579
Generated	3,824	4,039	4,189	4,464	5,031
% to Market/ Utilized	96%	88%	81%	76%	71%
% Managed (incl. baled and landfilled tires)	104%	99%	97%	91%	86%

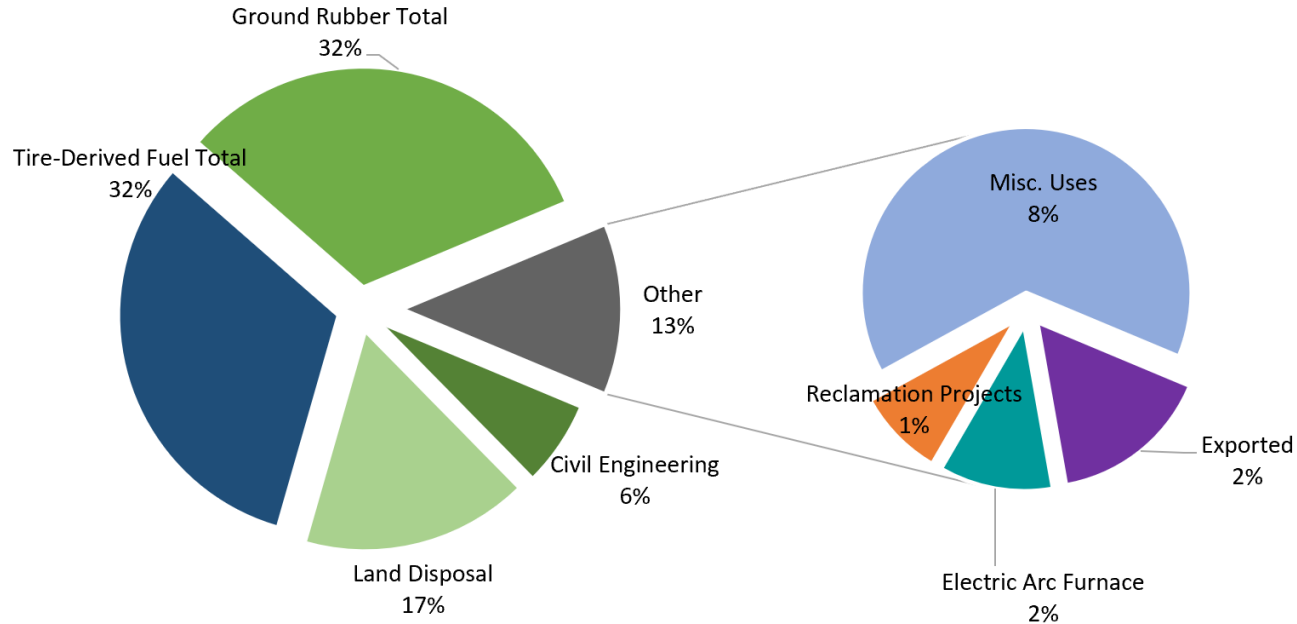
<sup>1</sup>The U.S. Scrap Tire Management Summary began tracking tires culled from scrap tire collection entering domestic passenger and light truck used tire markets in 2009 by including used tires as a market for scrap tires. The U.S. Scrap Tire Management Summary now subtracts used tires from the total tires hauled to calculate total net scrap tire generation, a practice that began with the 2011 edition

<sup>2</sup>In 2005 and 2007, annual scrap tire generation estimates were based on state-provided data. Now, these estimates are based on a calculation of replacement market tires sold and vehicles scrapped, a practices that began with the 2009 edition.

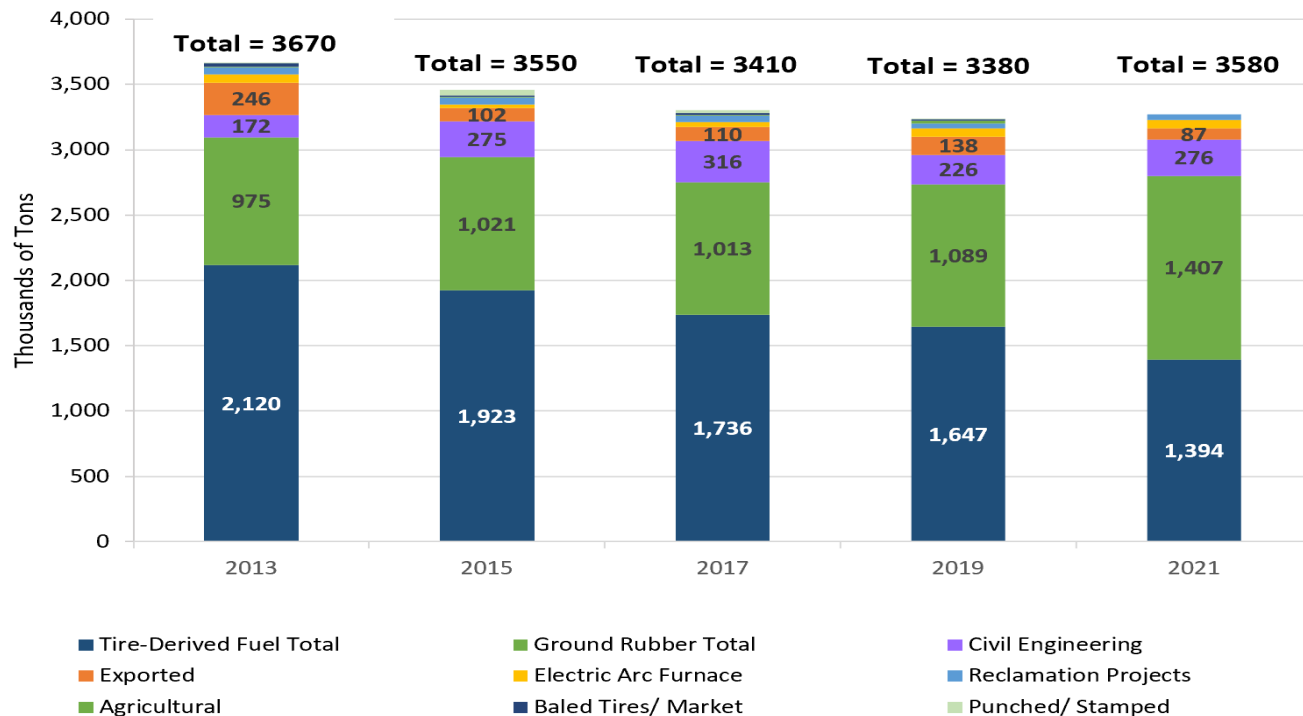
# U.S. Scrap Tire Market Trends 2013 - 2021



# U.S. Scrap Tire Disposition 2021



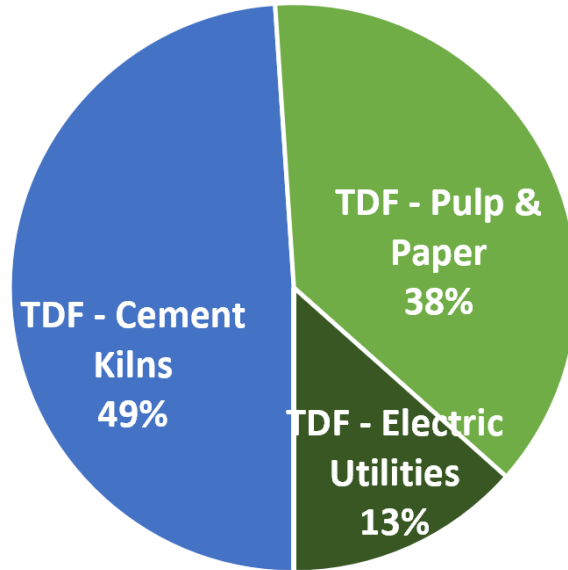
# U.S. Scrap Tire Market Trends 2013 – 2021



\*The U.S. Scrap Tire Management Summary report began tracking tires culled from scrap tire collection entering domestic passenger and light truck used tire markets in 2009 by including used tires as a market for scrap tires. The U.S. Scrap Tire Management Summary report now subtracts used tires from the total tires hauled to calculate total net scrap tire generation, a practice that began with the 2011 edition.

# U.S. Tire Derived Fuel Markets 2021

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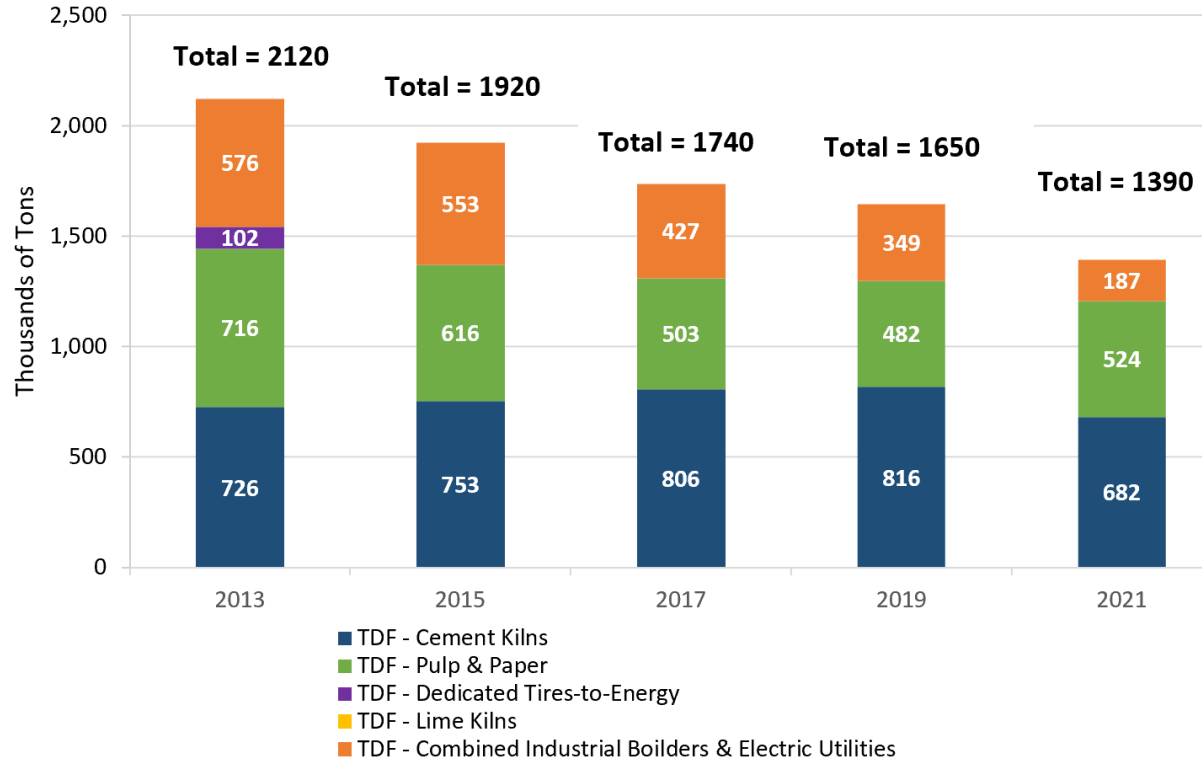


## ***Did you know?***

Total scrap tires diverted to TDF market:

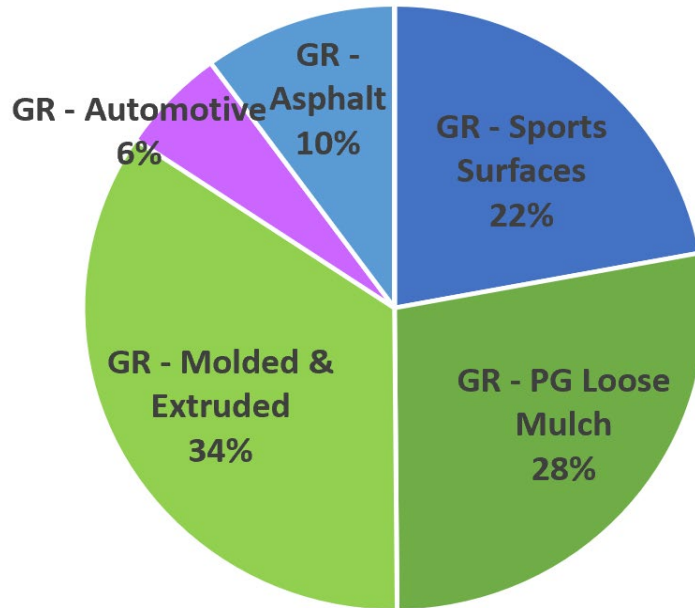
1,390,000 tons or over 76 million tires

# U.S. Tire Derived Fuel Market Trends 2013 –2021



# U.S. Ground Rubber Markets 2021

(percent of total pounds of scrap tires consumed in market)

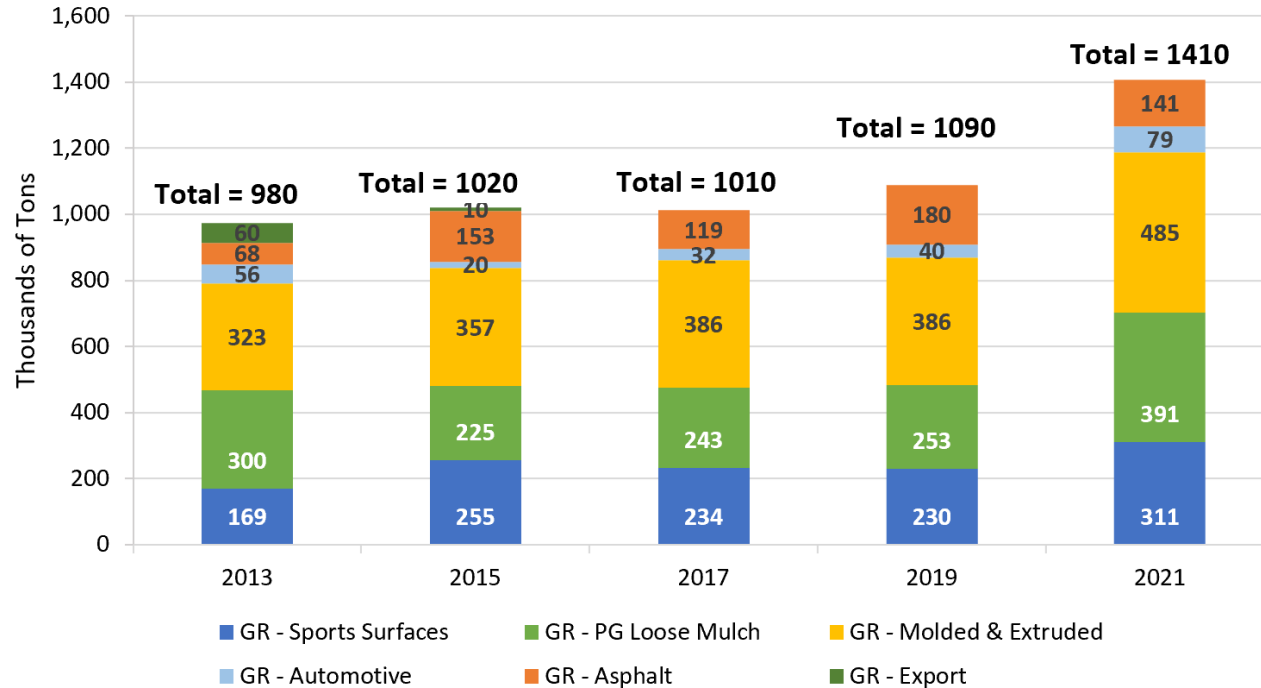


## ***Did you know?***

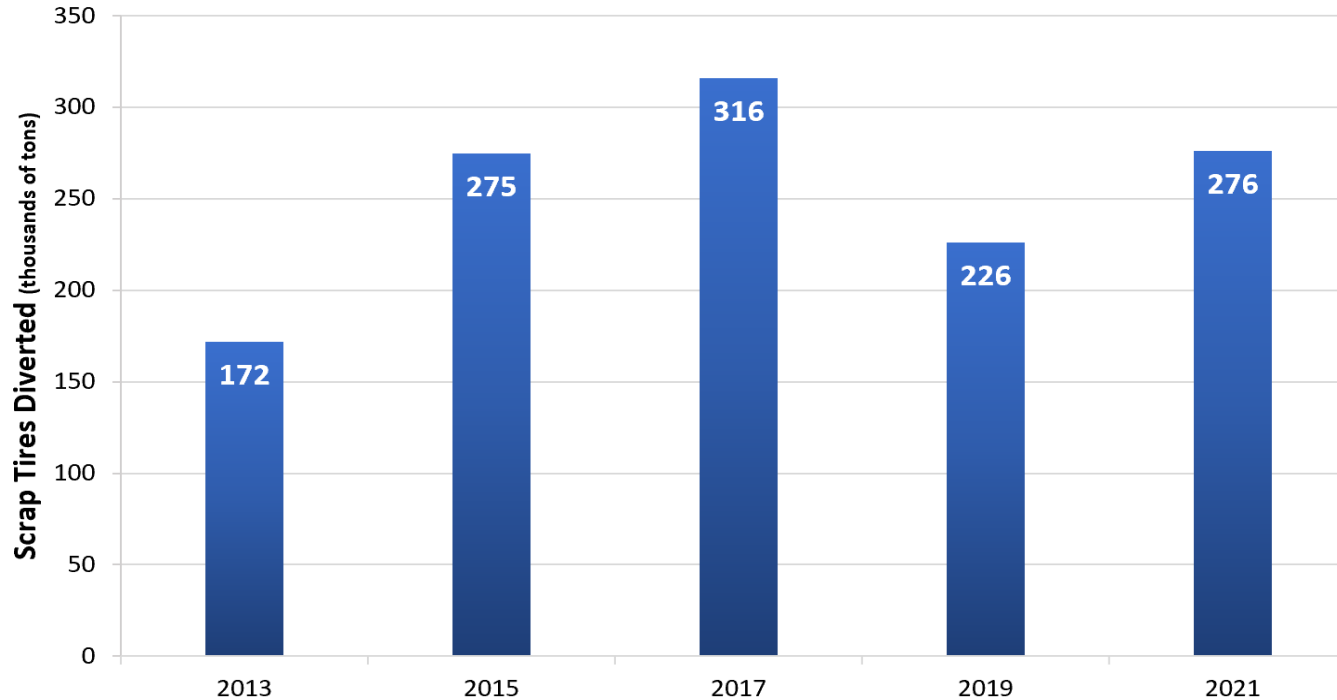
Total scrap tires diverted to ground rubber markets:  
*About 1,410,000 tons or over 77 million tires*



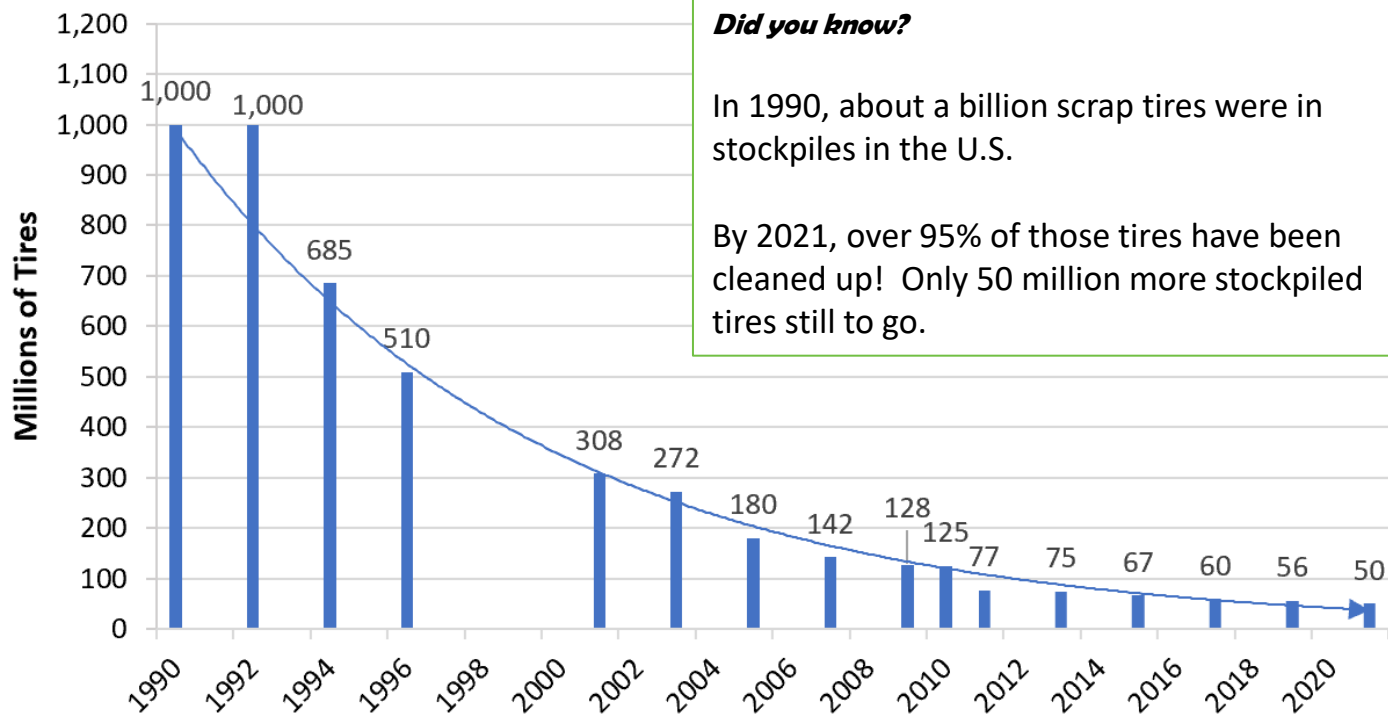
# U.S. Ground Rubber Market Distribution 2013 - 2021



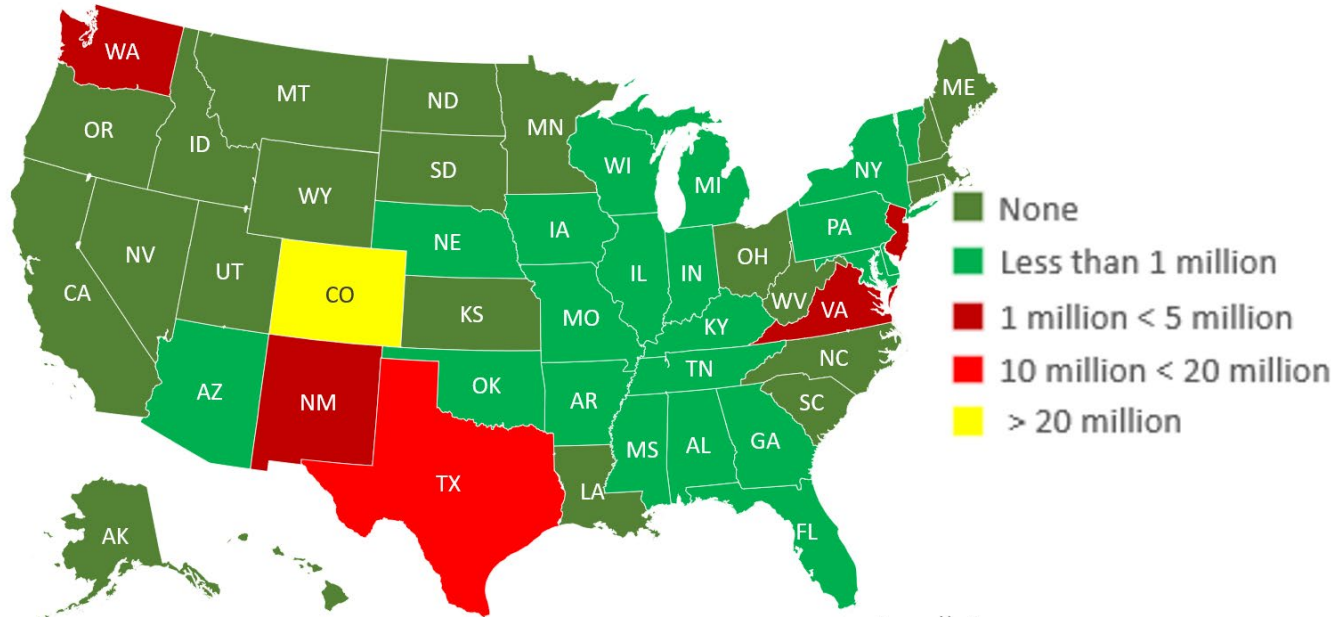
# U.S. Civil Engineering Markets 2013 - 2021



# U.S. Stockpiled Scrap Tires 1990 - 2021

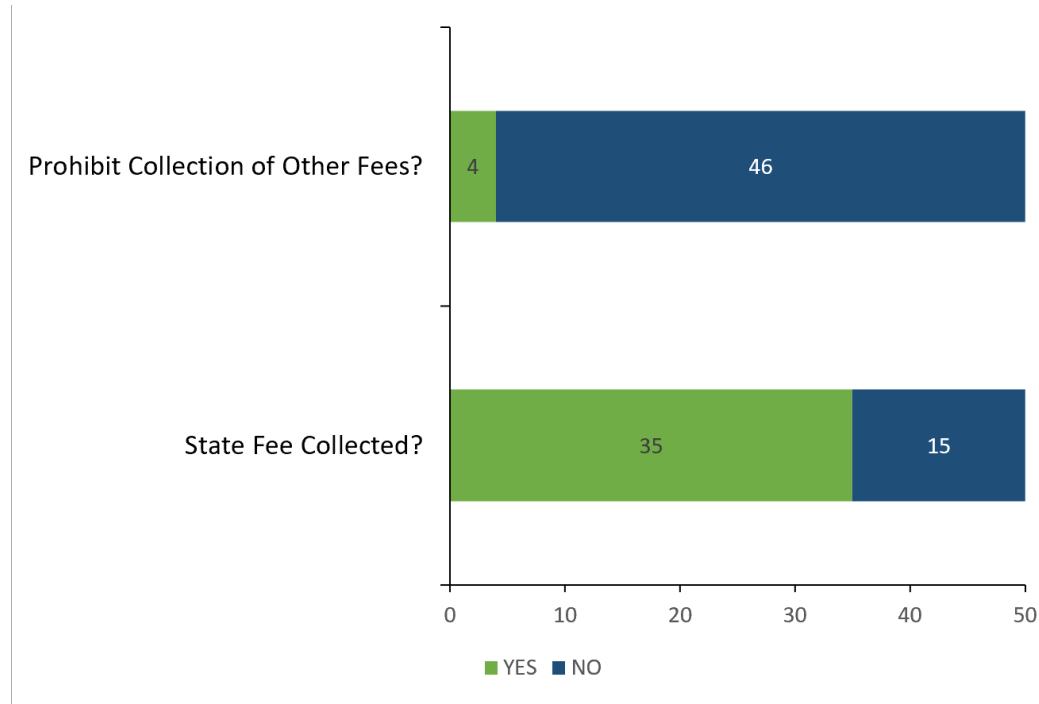


# Stockpiled Tires Remaining in the U.S. 2021

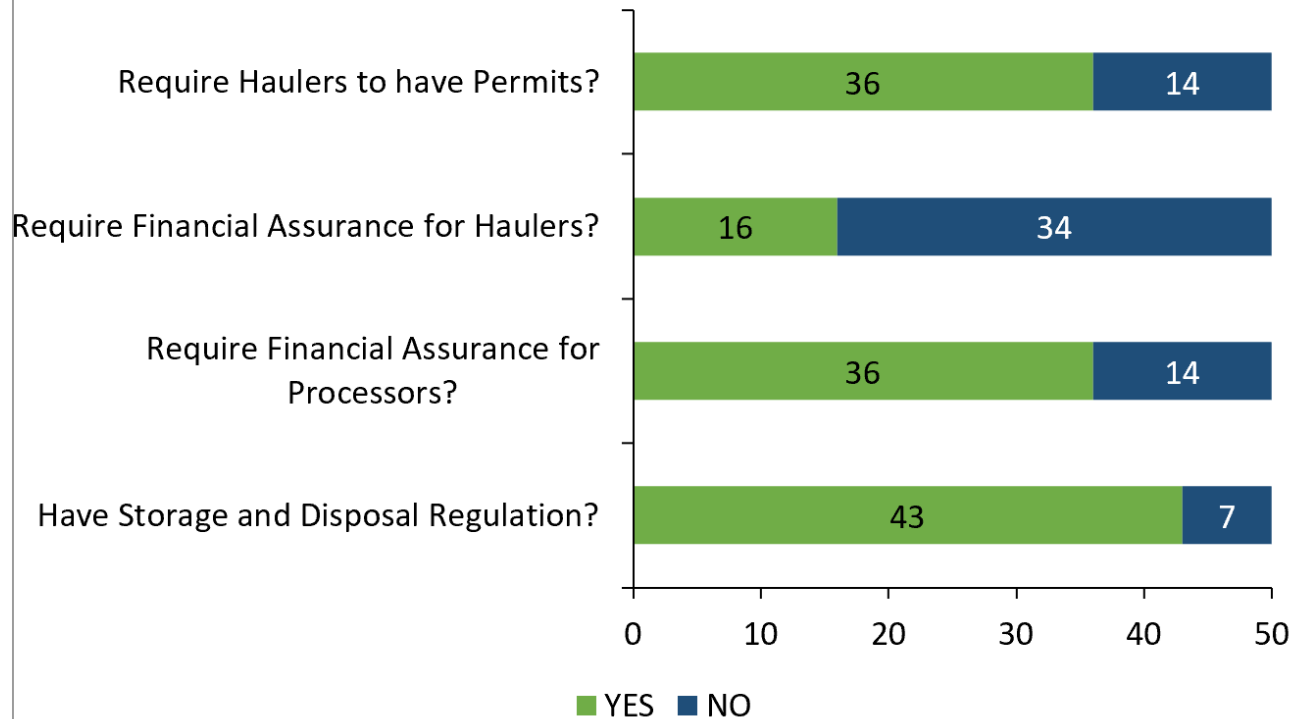


CO: Includes  
50% of its  
monofill  
inventory

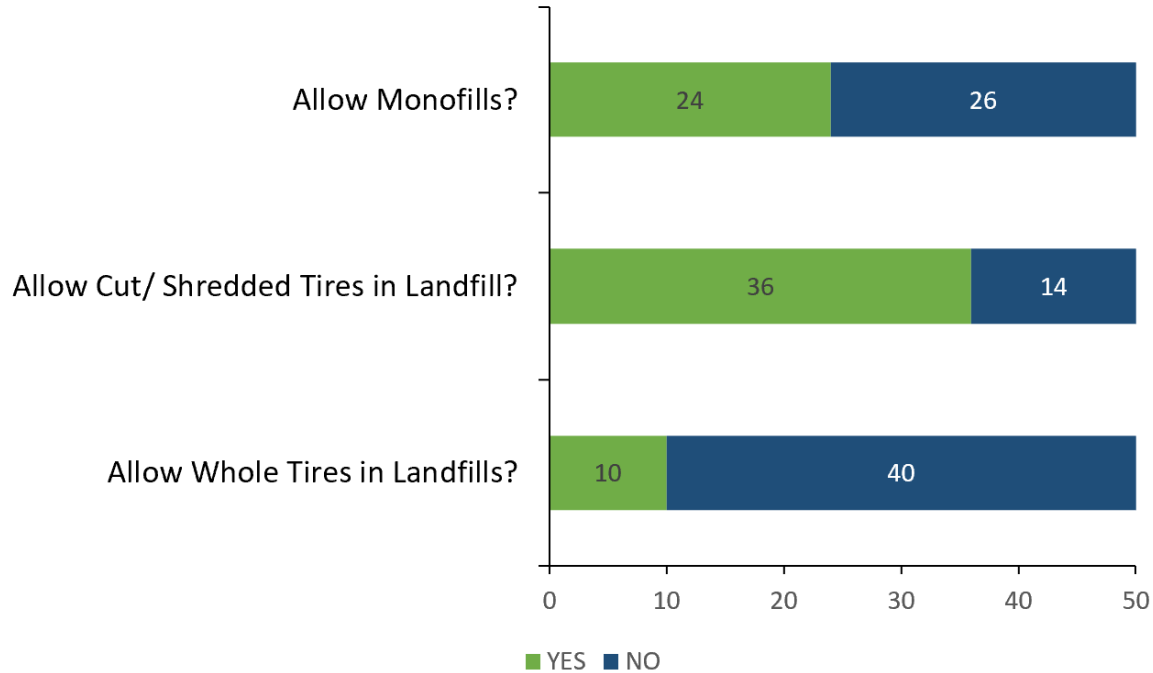
# Overview of Current State Programs



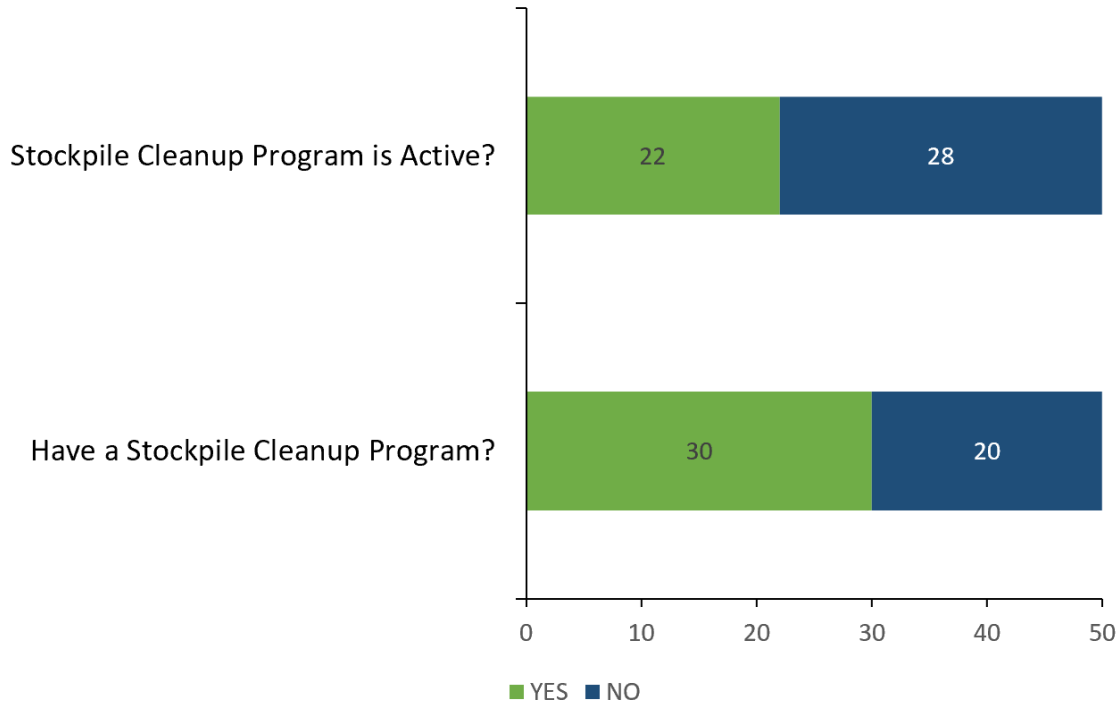
# Overview of Current State Programs



# Overview of Current State Programs



# Overview of Current State Programs





# Key Actions for the Future

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- Since markets are not keeping pace with generation, we need to develop and grow markets. Scrap tire recycling is demand driven
- Strong markets discourage illegal dumping and stockpiles
- USTMA remains committed to working with all stakeholders including value chain partners, states, academia, NGOs to achieve 100% recycling into sustainable and circular end use markets
- Scrap Tires offer infrastructure solutions – historic opportunity
- States should utilize New Tire Fees for market development including grants and demonstration projects and research to fill data gaps
- We support an EPA portal to collect consistent, accurate, real time recycling data

# USTMA Next Steps

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- Collaboration
- Research
- Market Development – specifically Rubber Modified Asphalt and TDA for infrastructure projects
- Supporting State Programs



# Bolder Industries

Transformative circular solutions

## Presentation Prepared for **US Scrap Tire Workgroup**

*November 7, 2022*



**ISO 9001:2015**  
Certified  
Company





# Bolder Industries

Transformative circular solutions

**Founded in 2011, our vision is to deliver circular solutions that will transform manufacturing sustainability worldwide.**

*Our mission is threefold:*

- 1. Significantly reduce landfilling*
- 2. Drastically cut emissions, water, and energy usage*
- 3. Create local jobs in an emerging industry*

**We convert end-of-life tires and scrap rubber into our sustainable products:  
BolderBlack® and BolderOil™**

- Proven proprietary process utilizes **98%** of every scrap tire: **98%** less CO<sub>2</sub>, **85%** less water and energy compared to virgin carbon black*
- **ISO 9001** Certified, **ISCC PLUS** Certified, and a **Certified B Corp***
- We partner with customers and organizations committed to sustainability and ESG*

# Our Circular Solution

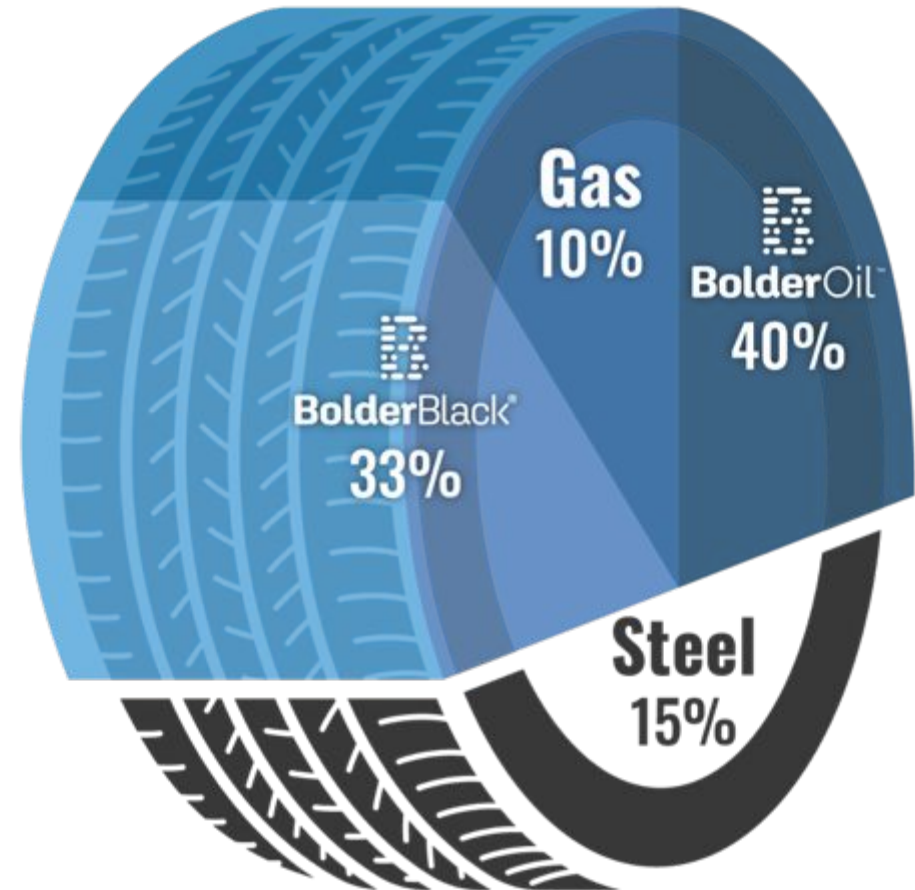
Bolder Industries proprietary process **recovers 98% of the tire**, delivering two primary products

## **BolderBlack**<sup>®</sup>

Sustainable alternative to virgin carbon black used in everything from phone cases to high-performance tires.

## **BolderOil**<sup>™</sup>

Sustainable petrochemical used in solvents, renewable fuels, and as a feedstock for carbon black oil (CBO).



# BolderBlack®

## **Commercially-proven alternative to virgin carbon black (vCB)**

- BolderBlack is a sustainable product sourced from post-consumer rubber by Thermal Depolymerization
- Delivers circular solution to customers, used alone or blended with furnace carbon black in numerous rubber, plastic, and liquid applications



### **Tires**

- BolderBlack successfully formulated into several tire compounds
- BolderBlack is comparable to vCB up to 50% loading without affecting the rubber properties in the side wall and inner liner
- Reduces hysteresis (heat build-up) and provides similar reinforcement to N772/N660 vCB (virgin carbon black)
- More cost effective than vCB

### **Manufactured Rubber Goods (MRG)**

- Superior performance in numerous industrial and automotive applications (EPDM, SBR, Neoprene for belts, hoses, anti-vibration, diaphragms, etc.)
- Used to keep dust and moisture out, reduce noise, or stabilize items in place
- Delivers UV resistance, reinforcement, and low PAH

### **Plastics, Inks & Coatings**

- Provides tint strength similar to N330 vCB
- Superior blue tone when compared to vCB
- Delivers Low PAH and UV resistance

***BolderBlack is the leading sustainable rCB in the market***



# BolderOil™

***BolderOil delivers circular solutions for specialty chemicals, petrochemicals, and oil & gas industries***

- Delivers sustainability for high-demand markets
- 1 scrap tire = One gallon of BolderOil
- Cost effective and stable pricing—decoupled from oil & gas indices



## **BolderOil Base**

- Sustainable petrochemical feedstock with a wide variety of applications
- Supports circularity efforts of chemical manufacturers that supply sustainability-focused customers
- Proven as a renewable fuel

## **BolderOil Light**

- Sustainable aromatic organic solvent
- Reduces paraffin wax deposition in production equipment, transportation vessels, and down-hole applications
- High-performance substitute for Xylene and Toluene for asphaltene and wax dissolution

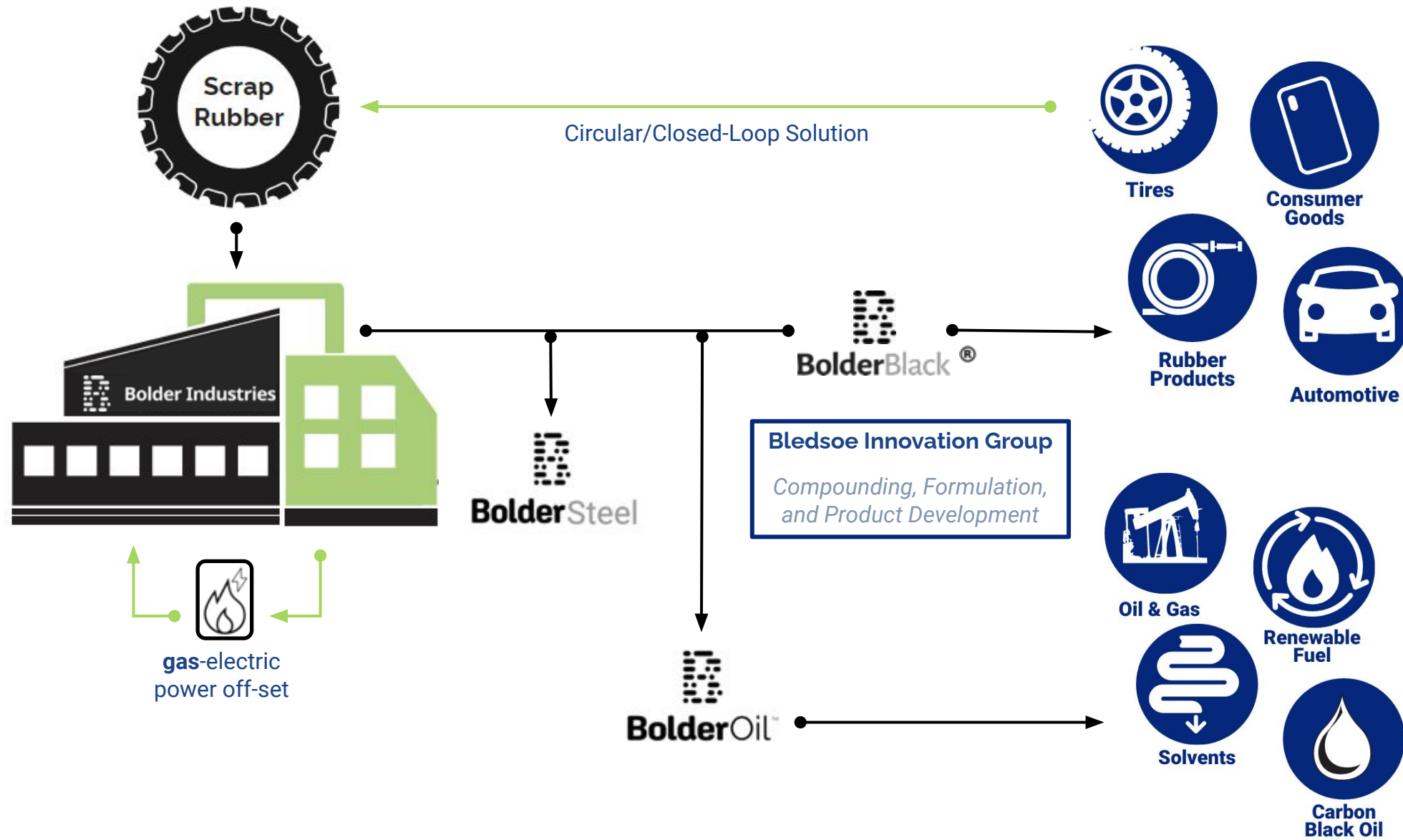
## **BolderOil Heavy**

- Feedstock for production of sustainable, ASTM-grade virgin carbon blacks
- Compatible with Carbon Black Oil (CBO)
- Increases tire and rubber circularity
- Price independent of CBO and heavy fuel oil indices

***BolderOil delivers circularity for massive petrochemical and oil & gas markets***



# Proprietary Process, Proven Products, IP Protected





# ESG Benefits and Environmental Savings



96%  
Less  
**CO<sub>2</sub>**



98%  
Less  
**Water**

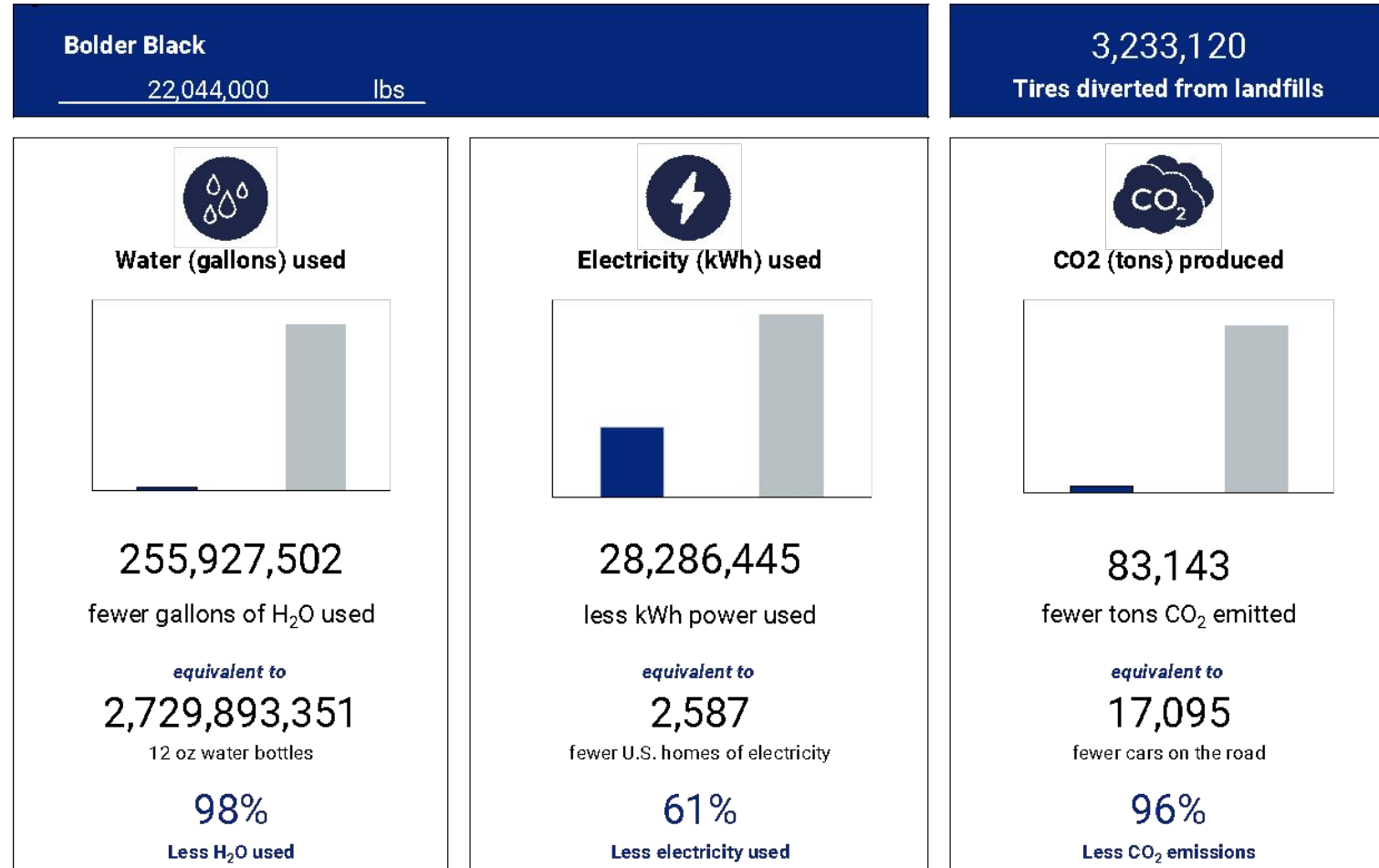


61%  
Less  
**kWh**



40-50  
**CleanTech  
Jobs**

*Savings compared to virgin carbon black production and based on the annual production of a 3-Reactor Bolder Industries facility.*

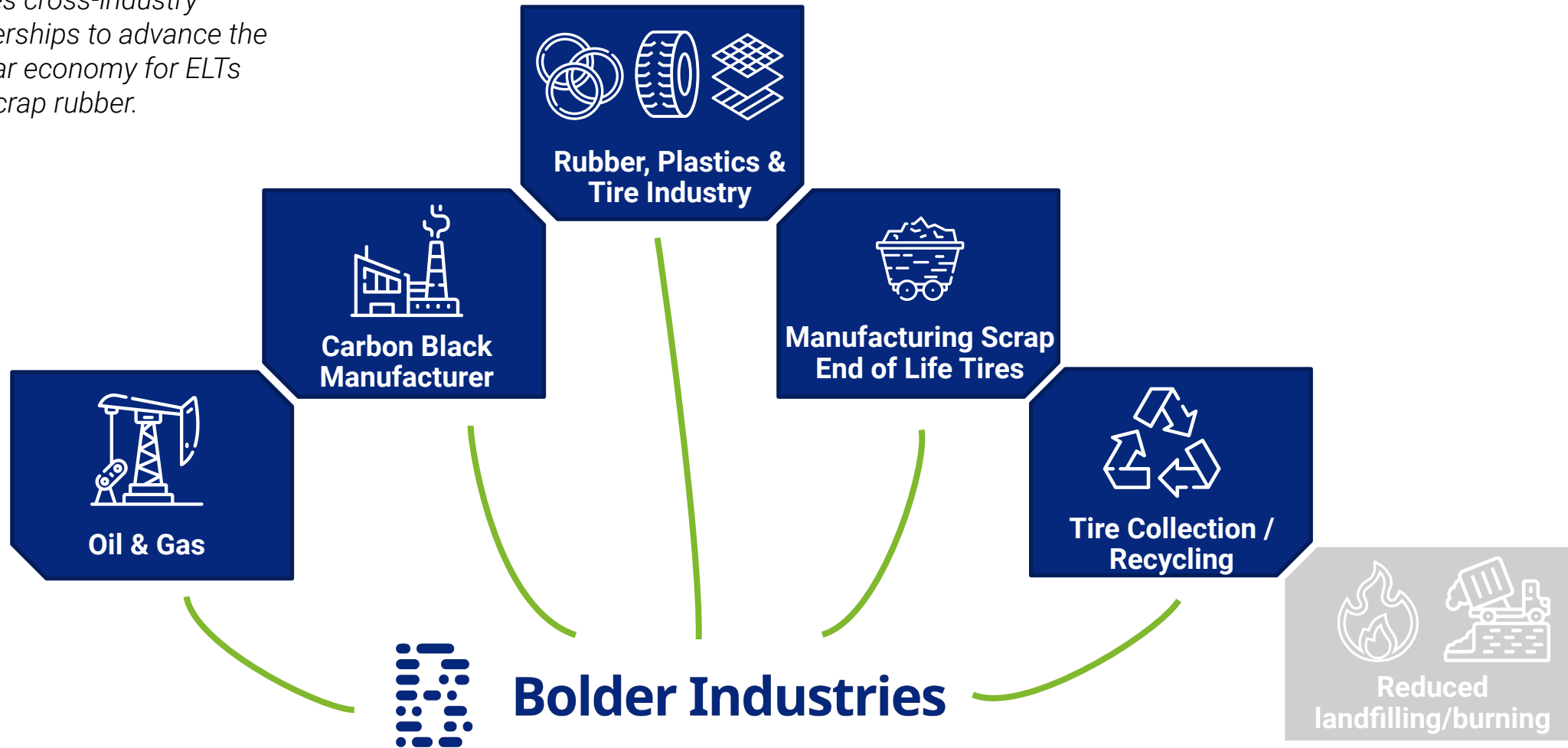


Note: Based on a life-cycle analysis (LCA) performed by Bolder Industries and technically evaluated by ThinkStep.



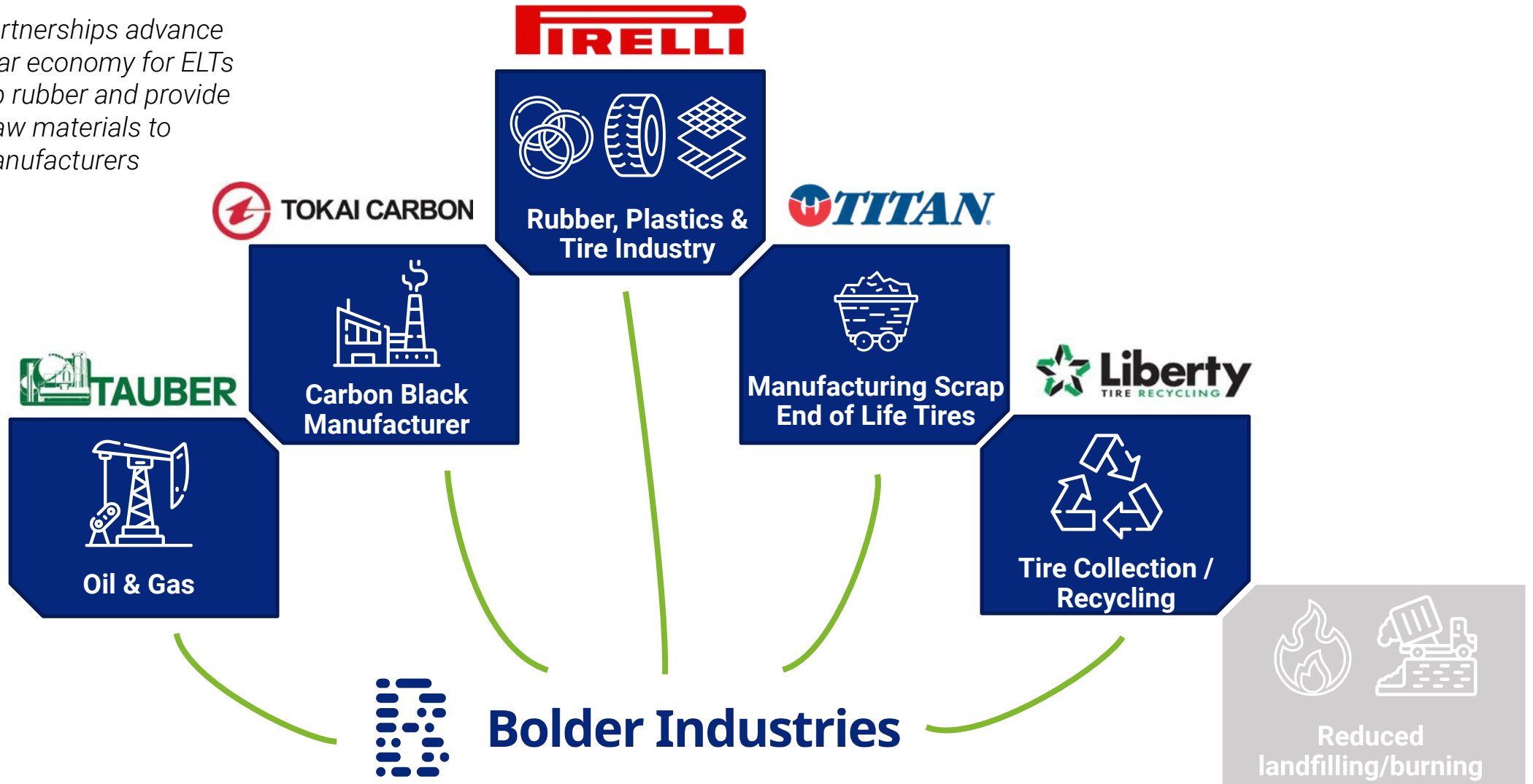
# Bolder Industries Closed Loop Cycle

*Bolder closes the loop and creates cross-industry partnerships to advance the circular economy for ELTs and scrap rubber.*



# 6 Collaborations Create a Circular Economy

*Bolder partnerships advance the circular economy for ELTs and scrap rubber and provide circular raw materials to global manufacturers*



Note: Select collaborations shown, not comprehensive of all Bolder Industries partnerships



# 3,000+ Proven Product Applications

## BolderBlack Applications

### Rubber and Plastic Goods

#### Automotive

Tires  
Weatherstripping  
Gaskets  
Seals  
Muffler Hanger  
Motor Mounts  
Automotive Boots  
Grommets  
Wire Harnesses  
Plugs  
Bumpers  
Fluid Seals  
Transmission Gaskets

#### Plastics

Flower Pots  
Agricultural Pipe  
Paints  
Phone Cases

#### Liquids

Inks  
Coatings/Paints

#### Commercial / Industrial

Hosing  
Tubing  
Cables  
Conveyor Belting  
Roofing Membranes  
Drive Belts  
Diaphragms  
Liners  
Wetsuits  
Air Ducts  
Architectural Seals

## BolderOil Applications

### Liquid Products

#### Solvents

Oil Well Cleaning  
Tank Cleaning  
Chemical Extract  
Wax Mitigation  
Viscosity Modification

#### Fuels

Marine Fuels  
Transportation Fuels  
Blending  
Burner Oil

#### Heavy Oil

Carbon Black Oil  
Asphalt Binder  
Crude Blending



# Customer Testimonials



*"This is exactly the type of business innovation our industry needs. We can maintain our current collection routes, have insight into our end-of-life tires and have an opportunity to work directly with our current suppliers to purchase sustainably sourced raw materials for our manufacturing. It's a win-win for everyone involved."*

*– Luiz Polimeno, Global Purchasing Director of Pirelli Tire*

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*"This is exactly the next step we've been looking for."*

*– Hub Hubbard, Patagonia*

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*"Liberty is in constant pursuit of the highest and best use of end-of-life tires. We have been investigating the chemical extraction business for many years and Bolder has proven to be a partner we can rely on to work with us and our customers on a large scale. Bolder and Liberty are aligned in their goals to increase sustainability for waste tires and our new partnership will accelerate the growth and global expansion for both companies in this critically important space."*

*– Thomas Womble, CEO of Liberty Tire Recycling*

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*"To be able to take something as notoriously synonymous with pollution as an old tire, and repurpose it into literally hundreds of different useful products is an incredible achievement by Bolder Industries. We at Tauber Oil are delighted to have a hand in bringing to market products from our industry such as carbon black feedstock that not only reduce production emissions and natural resource use, but keep millions of tires out of landfills every year."*

*– David Tauber, Sr., Chairman of Tauber Oil*

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*"Tokai Carbon Company investigates circular solutions for our company and Bolder is a leading company in providing solutions for end-of-life tires. Bolder has assisted Tokai in becoming the world leader in delivering partly sustainable ASTM grade carbon blacks with our use of BolderOil."*

*– Bill Jones, President of Tokai Carbon Company*

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# Established and Expanding Rapidly



**Bolder Industries**  
MARYVILLE



- Commercial scale operations since 2019
- Generating revenue since 2015
- Operating 24/7
- Facility expansion completed Jan 2022
- Operating 2 reactors
- Over 3,000 in-market products using BolderBlack and BolderOil



**Bolder Industries**  
TERRE HAUTE



- 2<sup>nd</sup> NA facility commercial in 2023
- BolderBlack product expansion will allow access to larger volume, higher value markets (carcass grade, tread grade)
- Geographic location well-suited for access to feedstock and customer delivery



**Bolder Industries**  
ANTWERP



- 3<sup>rd</sup> EU facility commercial in 2024
- Selected as one of first circular concessionaires from dozens of applicants based upon sustainability and viability
- Superior access to EU customers and access to EMEA
- Provides canal, rail, deep water barge, motorway access
- Permitting phase



# Experienced Leadership Team



**Tony Wibbeler**  
CEO & Founder



**Ryan Carr**  
Chief Financial Officer



**Robert Fenwick-Smith**  
Chairman



**Nate Murphy**  
Head of Technology



**Kevin Brown**  
VP Manufacturing



**Michael Murray**  
VP Global Sales



**Bob Grier**  
VP Operations



**Jessica Hogan**  
VP Communications



**Wim Van den Broeck**  
Director, Project Development



**Ken Dunn**  
Director of Sustainability



**Leslie Wibbeler**  
VP Human Resources



**R. John Nadjafi, Esq.**  
General Counsel



# Relationships Drive the Circular Economy Forward



Top: Bolder Industries Maryville team, Bolder Team with the Ambassador of Belgium, Bolder and Michelin in France  
Bottom: Thomas Womble, Liberty Tire and Tony Wibbeler, Pirelli partners with Tony, Steve Gee, Kleenair and Tony, Bolder Circularity Forum 2022 Plant Tour Group







# Bolder Industries

## **Nate Murphy**

Head of Technology

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