Photo Credit: EGLE: - Dickinson County Road Commission

SCRAP TIRE MARKET DEVELOPMENT STUDY

Final Report | January 2020

EGLE
MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

RRS recycle.com

Managing change in a resource-constrained world.

ORGANICS MANAGEMENT

WASTE RECOVERY

GLOBAL CORPORATE SUSTAINABILITY

since 1986

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- What is Market Development?

PROJECT SCOPE

- In 2019, the EGLE Scrap Tire Market Development Program Issued an RFP for a Market Development Strategy
- The RFP had 3 parts:
  - Provide a summary report with strategic recommendations to build on the success of EGLE's scrap tire market development grants
  - Identify best management practices for the scrap tire recycling industry
  - Produce a Midwest directory of scrap tire market participants

Photo Credit: Deerpath/EGLE - Septic Field

Photo Credit: EGLE - Midland County Road Commission

METHODOLOGY

- Resource Recycling Systems (RRS) was awarded the contract.
- RRS research approach included:
  - Interviewed +25 industry leaders working at state agencies, universities, and market participants
  - Comprehensive review of EGLE grants, regulatory documents, and reports
  - Website and document review of Midwest state agencies
  - Site visits to tire processing facilities
  - Participation in Michigan Scrap Tire Advisory Committee
  - Coordination with US Tire Manufacturers Association
  - Participation in the 8th Scrap Tire Recycling Conference
  - Literature review of scrap tire reports and articles

WHAT IS MARKET DEVELOPMENT?

- A ‘Market’ is any place where two or more parties engage in an economic transaction that may involve goods, services, information, currency, or any combination of these that pass from one party to another.
- Market development involves promotion and advertising aimed towards the successful sale of products to end-customers.
- EGLE’s market development tools include:
  - Scrap tire market development grants
  - Enforcement
  - State/department policies
  - Agency priorities; executive mandates
  - Convening activities, e.g. US Scrap Tire Work Group, interagency cooperation, speakers
  - Public relations campaigns
  - Engaging outside experts, e.g. Resource Recycling Systems, Entech, First State Tire Recycling, Recycling Research Institute/Scrap Tire News

Photo Credit: EGLE - Ontonagon, Lake Superior shoreline

EXECUTIVE SUMMARY & RECOMMENDATIONS

Photo Credit: EGLE - Midland County Road Commission

EXECUTIVE SUMMARY

Nearly three decades ago, one billion tires littered communities across the U.S., triggering spontaneous fires, marring the landscape, and serving as breeding grounds for mosquitoes.

Across the country, states began enacting regulations to drive enforcement, clean-up, funding, and market development efforts, thereby catalyzing the scrap tire reuse industry in America.

Now a $1 billion industry, each year +300 million scrap tires are collected, processed, and sold to markets for secondary uses.

This is a monumental success story!

Photo Credit: EGLE - Midland County Road Commission

EXECUTIVE SUMMARY
(CONT.)

In 1990 the State of Michigan created the Scrap Tire Regulatory Act and subsequently formalized its grant process with the Scrap Tire Regulatory Fund.

Today, approximately10 million scrap tires are generated annually in Michigan, and processed into tire-derived fuel (TDF) (68%), other uses (22%), and authorized landfill (10%).

However, the TDF market is waning, and Michigan must pivot and grow new markets that are more sustainable and economically viable.

Photo Credit: EGLE - Midland County Road Commission

EXECUTIVE SUMMARY
(CONT.)

In embarking upon the transformation, Michigan EGLE is well-positioned to drive market development and continue its leadership in Michigan and across the Midwest region.

By taking vital and distinct actions, Michigan can transition the scrap tire industry from one of "managing waste" to "creating economic value," and in so doing, continue to champion a robust Circular Tire Economy of the future.

RECOMMENDATIONS (1-9)

1. Adopt a diversified portfolio approach for end market development and establish specific targets for Michigan to achieve national percentages in tire reuse markets.

2. Streamline administrative processes within the EGLE Scrap Tire Program to reduce inefficiencies and redundancies, thereby leaving more time for market development.

3. Take measures to incrementally reduce annual clean-up grant disbursements, thereby freeing funds to deploy toward market development.

RECOMMENDATIONS (CONT.)

4 Restructure the market development grant qualifications and evaluation criteria to emphasize the creation of demand-pull revenue streams.

5 Create an annual "scrap tire economic value (STEV)" metric for measuring and reporting on Michigan's scrap tire market performance, thereby emphasizing value-creation opportunities rather than simply waste reduction.

6 Take specific measures to increase the use of rubber-modified asphalt (RMA).

RECOMMENDATIONS (CONT.)

7 Launch a campaign to leverage the "home court advantage" of major automotive OEMs and tier 1 suppliers for the use of ground tire rubber (GTR) and micronized rubber powder (MRP) in their components; consider targeting other key industries as well.

8 Transform the Scrap Tire Advisory Committee into an action-oriented coalition, focusing on the activation of innovative value-creation opportunities in the scrap tire reuse industry.

9 Strengthen the US Scrap Tire Work Group (STWG) and US Tire Manufacturers Association (USTMA) relationships to build a high-impact "circular tire economy collaborative."

Photo Credit: EGLE - Dickinson County Road Commission

TOP PRIORITY: ADOPTION OF RUBBER MODIFIED ASPHALT

- While all 9 recommendations deserve action, rubber-modified asphalt (RMA) can be a galvanizing focal point for all other actions to follow.
- In pursuing RMA, the State of Michigan will broaden its end-use portfolio and create high economic value, and by necessity leverage its relationships with other agencies, and streamline and restructure its grant process.
- In so doing, EGLE can create a compelling momentum shift, thereby fostering a longer-term "circular tire economy" transformation.

"We could use 100% of our scrap tires paving our roads."

— RMA INDUSTRY EXPERT

SCRAP TIRE MARKETS AND PRACTICES

- Overview
- End Use Markets
- Collaboration
- Regulatory Frameworks
- Private Sector
- EGLE Program
- Michigan Market
- Key Themes and Drivers

Photo Credit: Shutterstock

MARKET PROFILE OF THE US SCRAP TIRE INDUSTRY

- Transitioning to maturity; annual revenue of +$1billion
- Growing slightly faster than GDP
- Other than Liberty, very regional footprint of processors
- Emerging new-technology companies are approaching commercial viability (e.g. Delta-Energy, Pyrolyx, Bolder Industries)
- Need for economies of scale (e.g. Liberty, pyrolysis) but also with competition and continued "owner-operator" innovation
- Need for adoption of new technologies and innovation to address continued design evolution of tires
- Diversified end use portfolio with decline of Tire Derived Fuel

"You can't have a niche-driven processor; you need a $10 million production line."
— MIDWEST STATE REGULATOR

END USE MARKETS OVERVIEW

- A diversified scrap tire end-use market portfolio has emerged in the past 20 years.
- Each reuse has its own nuance of economic drivers, environmental impacts, supply chains, and end consumers. (See Exhibit 1 for a summary of market growth potential, value, and environmental benefits.)
- Embracing this portfolio -- and pursuing multiple markets for growth -- will allow a risk-managed and more stable demand stream in which to operate.
- In so doing, Michigan scrap tire market will remain resilient to market pressures such as natural gas prices, economic cycles, changes in administrative and regulatory policies, and technological trends.

Photo Credit: EGLE - Midland County Road Commission

"A key to a successful scrap tire program is to develop multiple markets."
— MIDWEST STATE REGULATOR

Photo Credit: Shutterstock

END USE MARKETS: TIRE DERIVED AGGREGATE (TDA)

- Should be at least 20% of the scrap tire market nationally, if not more
- While other uses of crumb rubber (also referred to as ground tire rubber, or GTR), such as athletic fields, have more favorable value, there is a clear place for TDA
- TDA has inherent advantages to sand and gravel
  - light weight
  - drainage
  - low pressure on walls
  - thermal insulator
  - low vibration
- TDA has an approved ASTM spec
- In determining specific applications, attention to relevant regulations is necessary.
- Monte Niemi (First State Tire Recycling) is noteworthy for his development of the market in Minnesota and neighboring states, and his 'I DO TDA' model for licensing can facilitate broader geographic dispersion and scale

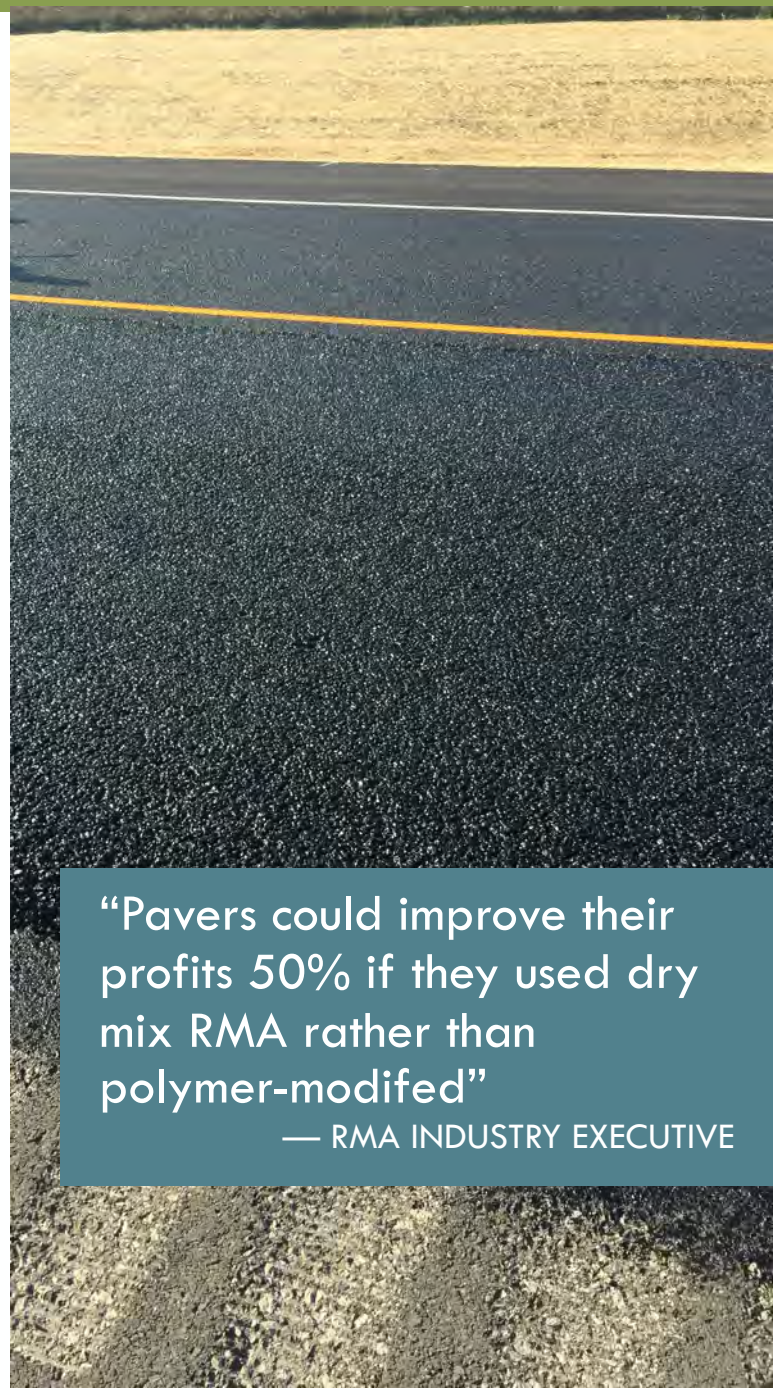
"First State Tire is a great example of the private sector doing the market development through promotion and standardization."

— USTMA

Photo Credit: Shutterstock

END USE MARKETS: RUBBER-MODIFIED ASPHALT (RMA)

- RMA faces multiple barriers, both real and perceived
  - 1990s mandates issued before the RMA technology was proven
  - Myriad state specifications
  - Risk-averse DOTs
  - Risk-averse (and profit-margin-challenged) pavers not wanting to learn and change
  - Perception of cost disadvantage
  - A strong polymer lobby protecting market share
  - Superpave specs that aren't necessarily required for city/county
- Despite these barriers, RMA success is real in warm and cold regions
  - RMA is ready for national growth, particularly dry method
  - RMA can be a superior road, period. Cost, quality, durability, processor-approved. It's not just for warm-weather climates (e.g. IL Tollway)
  - RMA suppliers are poised to support a Michigan campaign, as both Seneca (terminal blend), and Asphalt Plus (dry method) are approved to specifications and currently supplying product for Illinois Tollway projects
  - Incentives should be directed to entice industry partners



"Pavers could improve their profits 50% if they used dry mix RMA rather than polymer-modifed"

— RMA INDUSTRY EXECUTIVE

Photo Credit: Shutterstock

END USE MARKETS: MICRONIZED RUBBER POWDER (MRP)

- Crumb rubber in sizes smaller than 80 mesh are typically referred to as MRP
- MRP can be produced via ambient processes, such as those of Entech, or through cryogenic means (Lehigh Technologies)
- MRP can be compounded with other raw materials for subsequent use in injected-molded products
- MRP has had some success as a raw material for parts in the auto industry, although without the growth that some practitioners would expect
- Auto industry could be an opportunity for identifying the enablers and barriers to MRP growth
- Michelin, in recently acquiring Lehigh Technologies, would appear to see the upside opportunity in this regard

Photo Credit: Shutterstock

END USE MARKETS: EMERGING TECHNOLOGIES

- Pyrolysis for recovered carbon black (rCB) could be on the brink of turning the corner (markets for char being developed)
- Pyrolysis/rCB plants (examples): Pyrolyx, Bolder Industries, Delta-Energy
- Bridgestone's recent acquisition of Delta-Energy suggests the pyrolysis industry may be closer to reaching its commercially viable stage.
- ASTM has approved its first standard for rCB
- Other major industrials (e.g. Ford and Goodyear) are stepping up their efforts to use recycled rubber
- Steel wire recycling also growing

"Pyrolysis for the production of recovered carbon black (rCB) will be commercially viable in 1-2 years."

— INDUSTRY EXPERT

Photo Credit: Pexels

KEY MARKET DRIVERS: COLLABORATION

- Inter-state collaboration interest (Ohio and Kansas have expressed interest, among others; so has Michigan)
- Public-private and across sector competitors (e.g. USTMA and US STWG)
- STWG needs more market representation (also more private sector) and possibly full-time staff
- With universities; University of Missouri - Columbia is a noteworthy example to explore means of funding, research priorities (possible consortium with Michigan Tech University and the University of Akron)
- Across agencies, particularly DOTs but also Economic Development (MI has had favorable response, but it has been difficult to maintain momentum)
- There may be an opportunity for a more focused approach across regions and sectors

"We would like to partner with nearby states to [harmonize] permits and specifications."

— MIDWEST STATE REGULATOR

Photo Credit: EGLE - Midland County Road Commission

KEY MARKET DRIVERS: REGULATORY FRAMEWORKS

- State framework will drive collection practices (e.g. Kansas net importer for landfill); recommend barriers to monofill as a minimum
- Varying degrees of focus on market development (vs. enforcement); also variation in means for securing fees and allocating costs/grants
- This disparity is driven by many factors, including political ideology, changes in administration, shifting financial and community priorities.
- Michigan generally gets credit as a leader among its Midwest neighbors
- Each state needs an advocate

"Whenever a new governor and administration comes in you have to start over."
— MIDWEST STATE REGULATOR

Photo Credit: EGLE - Midland County Road Commission

KEY MARKET DRIVERS: REGULATORY FRAMEWORKS

- Tipping fees are essential until higher value-add end uses achieve necessary volume
- States already operate in a quasi-ecosystem (some are net exporters and some are net importers), but only because some neighboring states have the processing companies; in some cases the finished product (TDA and CRM) returns to "tire exporting states" as finished product; so the economic loop is not closed within a state
- Significant institutional knowledge and experience reaching retirement -- is this a risk or opportunity?
- Risk aversion among agencies (e.g. DOT) that are needed to partner with scrap tire initiatives
- All told, tires are not necessarily a waste problem anymore (well-managed return loop, 1% tires vs. 40% plastic); rather, it is a $billion+ value-creation opportunity.

SUCCESS FACTORS IN THE PRIVATE SECTOR

- Market dynamic between consolidation, regionality, and entrepreneurial innovation:
- Liberty has scale and geographic coverage, and product portfolio diversity
- But Liberty may have lost key expertise when they acquired firms, and their "corporate short-term profit" mindset may stifle local market development (Pennsylvania example)
- Owner-operators are great examples of organic success (Entech, First State Tire, Asphalt Plus)
- Successful companies create value, rather than chasing tipping fee subsidies

Photo Credit: Deerpath/EGLE - Septic Field

"To make money as a processor you need a volume of at least 1,000 tires/hour."
— LIBERTY PLANT MANAGER

Photo Credit: Deerpath/EGLE - Septic Field

SUCCESS FACTORS IN THE PRIVATE SECTOR

- The I DO TDA model (First State Tire) is quite intriguing for achieving scale while also enabling local state participation by service providers
- Institutional knowledge, expertise, and first-mover leadership is reaching retirement phase
- Michelin and Bridgestone investment/acquisitions are signs of private sector embracing this industry; could be an indicator and/or enabler of acceleration and growth
- To promote private sector, states should focus on favorable business climate; education and awareness among customers (e.g. pavers and contractors) and consumers (e.g. Indiana and Missouri); and market-driven incentives (but not subsidies)

"We don't focus on market development (e.g. investment in capacity) since the private sector is better [at making those decisions]."

— IOWA STATE REGULATOR

(note: Iowa only scraps 3 million tires/year but processors in the state do 9 million tires/year)

Photo Credit: Shutterstock

EGLE SCRAP TIRE PROGRAM

- The Michigan Scrap Tire Grant program is funded by fees from the Secretary of State which are taken at the point of vehicle title transfer
- Overall, EGLE is seen favorably by its Midwest neighbors in regard to its funding and grant process, its engagement with processors via the STAC, and its leadership on committees in the US Scrap Tire Work Group
- Evidence of EGLE's collaborative approach is the development of a Scrap Tire SWOT assessment, developed during a recent STAC meeting (see Exhibit 2).
- The success and potential of the EGLE Scrap Tire Program is hindered by programmatic and administrative challenges

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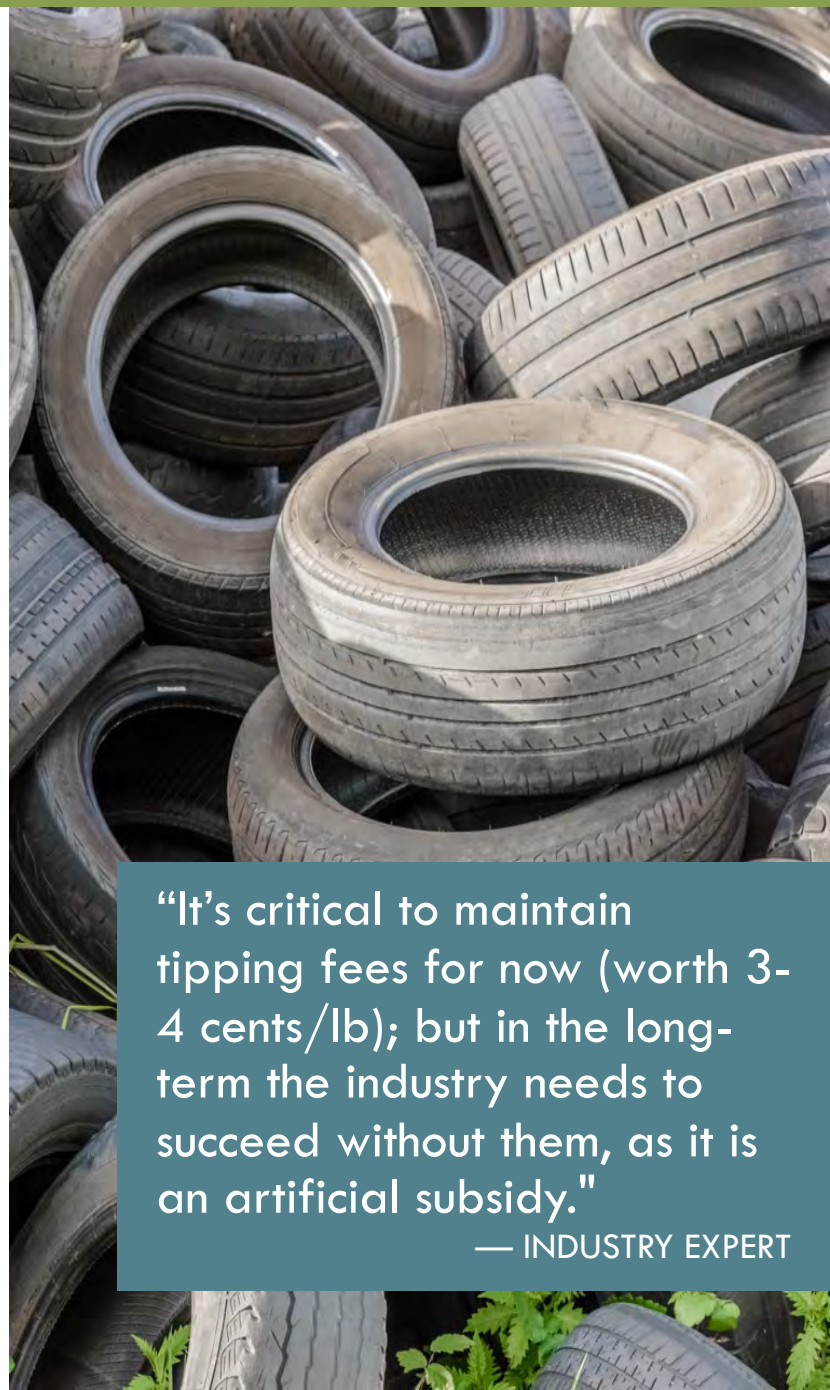
MICHIGAN MARKET CHARACTERISTICS

- Michigan produces approximately 10 million scrap tires per year
- The Michigan processor industry is comprised of small and mid-sized firms engaged in various facets of collecting, hauling, and shredding; in total there is extensive processor capacity in the State
- Michigan markedly over-represented in TDF (68% vs. 40% nationally) and under-represented in TDA, RMA, and crumb rubber
- These other markets represent an opportunity for EGLE in that they offer legitimate incremental value in cost, quality, and performance
- Michigan is well below national averages in crumb rubber (6% vs. 20%) and RMA (negligible vs. 4%)

Photo Credit: Shutterstock

KEY THEMES & DRIVERS

- The scrap tire industry is steadily transitioning; it is now a billion-dollar industry, yet still growing faster than GDP; the private sector has demonstrated that the market is shifting from one of "reducing waste" to one that is successfully "creating economic value."
- However, there is still a degree of subsidization through tipping fees.
- The market is shifting into an interstate eco-system, comprised of one national player, a number of successful regional mid-size "owner-operator" firms, emerging new-technology firms, and numerous tipping fee-dependent small firms.



"It's critical to maintain tipping fees for now (worth 3-4 cents/lb); but in the long-term the industry needs to succeed without them, as it is an artificial subsidy."

— INDUSTRY EXPERT

Photo Credit: Shutterstock

KEY THEMES & DRIVERS (CONT.)

- The end-use market is an evolving portfolio, with a decline in tire-derived fuel (TDF) in favor of growing markets in TDA, RMA, and other uses for crumb rubber.
- This structure is essential, as it allows for seasonality, full use of scrap tire tonnage, and market dynamics (e.g. pricing for oil, gas, virgin rubber, and steel).
- There are also recent indicators that newer technologies may soon create commercial viability for recovered carbon black through pyrolysis.
- State-supported market development tactics are diverse; they appear to be driven largely by constituency preference, administrative transitions, and changing dynamics in budgeting and priorities.

Photo Credit: Shutterstock

KEY THEMES & DRIVERS (CONT.)

- Private sector growth is best-enabled by a demand-pull, rather than subsidy-supported environment.
- Proprietary expertise has been leveraged by consolidation and/or unique licensing arrangements to create scale economies across state boundaries.
- The industry has benefited from involvement by major industry, both in embracing scrap tire reuse (e.g. Ford, Goodyear), and channeling direct investment (e.g. Michelin, Bridgestone).
- Collaboration is advocated but still work-in-process; many states have expressed interest in working together, and 3rd party associations (e.g. US STWG and USTMA) represent an opportunity to convene public, private, and university stakeholders toward common goals.

"The state agencies should focus on creating demand and let the private sector do what it does best."

— MIDWEST STATE REGULATOR

DETAILED RECOMMENDATIONS

RECOMMENDATIONS: PROGRAMMATIC/OPERATIONAL

1

Adopt a diversified portfolio approach for end market development. Establish specific targets for Michigan to achieve national percentages in tire reuse markets:

	US 2018	US Aspiration*	Michigan 2018
Tire-derived aggregate	8%	20%	6%
Rubber-modified asphalt	4%	20%	—
Crumb rubber other**	20%	35%	6% est.
Tire-derived fuel	40%	20%	68%
Other including export	13%	5%	10% est.
Landfill	15%	5%	10%
rCB	—	5%	—

* US Aspiration based on interviews with industry experts

** Includes athletic fields, molding/compounding, and micronized rubber powder

RECOMMENDATIONS: PROGRAMMATIC/OPERATIONAL

2 Streamline administrative processes and reduce inefficiencies and redundancies, thereby leaving more time for market development; preliminary opportunities include:

a. Administrative & Programmatic:

i. Establish protocol for STAC participation and a process to remove/replace members

ii. Establish consistent training and knowledge transfer for regulatory staff, given turnover considerations

iii. Develop uniform tire transportation manifest

iv. Review and establish consistent filing system for grant records and program management

b. Grant management:

i. Consider running 3 grant programs (Cleanup, Market Development, Law Enforcement) concurrently to reduce confusion from grant seekers and provide management efficiencies

ii. Explore ways to routinely extend grant funding across fiscal years; current process limits scope of projects and increases staff time dedicated to extensions

iii. Add support to manage administrative demands related to clean up grants, e.g. 250 payment requests and +5 levels of approval

iv. Develop consistent grant management process which currently is subject to continued change

c. MDOT-related:

i. Establish a mutually-agreeable process for exchange of data and timely reporting between MDOT and EGLE

ii. Strive toward participation by MDOT in the STAC meetings to ensure consistency and continuity of information flow

iii. Consider other organizational adjustments to further align goals and actions between the two agencies (note, see Recommendation #8 below).

RECOMMENDATIONS: PROGRAMMATIC/OPERATIONAL

3 Recognizing that most of the pre-1991 stockpile of tires has now been remediated, take measures to purposefully shift the grant funding proportion away from clean-up and instead toward market development:

i. Discourage grant requests for clean-up in cases where municipalities can otherwise pursue such projects independently.

ii. Emphasize regulatory enforcement, education, and local volunteer engagement instead of reimbursement.

iii. Reduce the reimbursement rate by 50%, i.e. to $500 per dropped trailer and $1 per PTE beyond the initial 500 tires.

iv. Consider developing more cost-effective logistics for clean-up haul-aways; for example employ regularly scheduled “milk runs” instead of one-time pickups.

RECOMMENDATIONS: PROGRAMMATIC/OPERATIONAL

4 Restructure the market development grant qualifications and evaluation criteria to emphasize the creation of demand-pull revenue streams:

i. Grant applicants should not be required to use a Michigan-located processor, provided the processor's scrap tire supply includes an equitable portion sourced from Michigan and an associated economic benefit can be assured; in so doing, EGLE will leverage economies of scale among processors in the broader eco-system that extends beyond state lines.

ii. Priorities should be placed on incentives for end-customer use rather than funding processor capacity; a requisite for processor capacity grants must be well-documented customer demand and its associated economic value.

iii. Require end-customer projects (for example road-paving) to include an educational and promotional campaign describing the incurred environmental and economic benefits that resulted from the project.

iv. Restructure the year-over-year budgeting process to ensure that multi-year requests can be accommodated; it may be as simple as making the grantee the first priority for its subsequent installment(s), providing the dollar amount is a relatively small percentage of the expected $2+ million annual fund.

v. Reclassify law enforcement grant requests into clean-up phase (i.e. not market development).

RECOMMENDATIONS: PROGRAMMATIC/OPERATIONAL

5 Create an annual "scrap tire economic value (STEV)" metric for measuring Michigan's scrap tire market performance, and provide its full transparency in the EGLE Scrap Tire Annual Report:

i. Calculation: Scrap tire tonnage X revenue/ton (excluding tipping fees*).
ii. For illustration, Michigan's current STEV is $4.8 mil; if they achieve the current national percentages, it would be $11.8 mil; at the aspiration level, $24.4 mil (see Exhibit 3 for assumptions and calculations).

* Note on tipping fee market impact: EGLE must embrace the subsidy inherent in tipping fees; currently, processors cannot operate profitably without them (about $2/tire, or $190/ton); as the industry shifts from TDA and TDF to higher value uses, the tipping fees will be less vital, but only when demand is successfully shaped; during this transition, such measures as more restrictive registration of new entrants may need to be considered.

RECOMMENDATIONS: EXTERNAL ENGAGEMENT

6 Take specific measures to increase the use of rubber-modified asphalt (RMA):

i. Convene an RMA work group with MDOT, appropriate community representatives and NGOs, and paving contractors; objectives include determining facts (and refuting misperceptions) about RMA specifications, costs, benefits, and technologies across the Midwest.

ii. Consider working with the Illinois Tollway to develop a spec that is more optimal than the existing MDOT permissive spec; it should entail 20-30 mesh ground rubber and allow the use of terminal blend, dry mix, and balanced mix specs. Note: Illinois Tollway experience indicates a 15-18 month duration for new spec approval (lab, shoulder, and full-road phases).

iii. Emphasize RMA projects for market development grants; preliminarily, target at least 25% of grant funds to be deployed for RMA.

iv. Reclassify RMA projects to exclude R&D designation, which tends to reduce the likelihood of grant requests and approvals.

v. Ensure MDOT support team commits to timely review of grants during the application cycle.

vi. Develop advocacy campaign promoting successful paving projects (e.g. billboards, “Do you like the ride? This road is paved with tires!”)

vii. Advocate governor executive order to spur adoption of RMA.

RECOMMENDATIONS: EXTERNAL ENGAGEMENT

7

Launch a campaign to leverage the "home court advantage" of major automotive original equipment manufacturers (OEMs) and tier 1 suppliers for the use of ground tire rubber (GTR) and micronized rubber powder (MRP) in their components:

i. Convene a "SWOT" session with OEMs, GTR and MRP suppliers, tire producers, and selected non-government organizations (NGOs); candidates include Automotive Industry Action Group, Original Equipment Supplier Association, Society of Automotive Engineers, and USTMA.

ii. Based on findings, establish the appropriate work teams to address opportunities and enablers.

iii. Engage private sector participants, including Lehigh and Entech (two leading providers of both cryogenic and ambient MRP) to delve into current barriers to growth.

Note: a similar focused effort can be pursued in other key Michigan industries, such as furniture manufacturing.

RECOMMENDATIONS: EXTERNAL ENGAGEMENT

8

Transform the Scrap Tire Advisory Committee into an action-oriented coalition, focusing on the activation of innovative value creation (both environmental and economic) opportunities in the scrap tire reuse industry:

i. Include the MEDC as a full-time member.
ii. Align the STAC's purpose with the MEDC's new strategic plan for "long-term prosperity and economic growth."
iii. Conduct cross-agency education to ensure a common understanding of individual goals, priorities, challenges, and tactics.
iv. Establish harmonized objectives that can collectively spur achievement of each agency's goals. Targets to be considered include:
    i. Scrap tire market mix improvement
    ii. Scrap tire industry revenue growth
    iii. Job growth and business attraction enabled by scrap tire markets
    iv. Road/infrastructure budget achievement with improved quality and performance (e.g. rutting, cracking, maintenance)
v. Pursue innovative business solutions that embrace the dual (and sometimes contradictory) objectives of scrap tire processor localization and economies of scale; an example is the First State Tire "I DO TDA" licensing opportunity.
vi. Acquire a deeper knowledge of the pyrolysis/rCB entrants that have located in other states; determine necessary market attributes to enable local investment in this emerging field.

(Note: the South Caroline Scrap Tire Sustainability Coalition is a possible partner for thought-leadership)

RECOMMENDATIONS: EXTERNAL ENGAGEMENT

9

Strengthen the US STWG and USTMA relationships to build a high-impact "scrap tire circular economy collaborative:"

i. Bring more "end-customers" to the table.
ii. Establish goals and metrics with accountability.
iii. Seek full-time support for the STWG staff.
iv. Establish 1-3 year goals and objectives.

TAKEAWAYS AND NEXT STEPS

TAKEAWAYS

- EGLE has an excellent foundation with its funding, grant structure, organization, and external engagement methods.
- EGLE is poised to accelerate its value creation in the Midwest scrap tire industry through programmatic actions, grant process enhancements, targeted market development, and expanded engagement.
- A primary market focus is rubber-modified asphalt.
- RRS is ready to offer its services to continue EGLE's scrap tire pursuits.

FUTURE WORK CONSIDERATIONS

- Facilitate Michigan adoption of RMA spec (dry, terminal, Balanced Mix) that is more permissive than the existing MDOT spec
- Facilitate STAC transformation (goals, structure, process, recruiting)
- Implement STEV metric and reporting process
- Inventory the geographic reach (e.g. within ~200 miles of tire sources) of higher-value market participants (i.e. vertically integrated firms whose end products extend beyond RMA and TDF)
- Additional market research: Canadian scrap tire industry, California rubber modified asphalt strategy
- Extend EGLE relationship to the World Business Council for Sustainable Development Tire Industry Project

Photo Credit: Shutterstock

EXHIBITS

1. Summary of End Use Markets & Environmental Benefits
2. EGLE SWOT Diagram
3. Scrap Tire Economic Value (STEV) Calculation

EXHIBIT 1: SUMMARY OF END USE MARKETS & ENVIRONMENTAL BENEFITS

END USE	OPPORTUNITIES FOR MARKET GROWTH	VALUE OF PRODUCT(S) CREATED	ENVIRONMENTAL BENEFIT (COMPARED TO ALTERNATIVE)
Tire Derived Fuel (TDF)	**Low:** Market it large but declining and unlikely to grow in short to medium term due to low natural gas prices	**Low:** typically uses chipped, shredded or whole tires which have low value	**Moderate:** Impact is less than that of coal or oil but greater than natural gas and renewables.
Rubber Modified Asphalt (RMA)	**Moderate:** Market is currently small. There are significant challenges but potential for rapid growth exists if key decision makers are convinced of benefits	**High:** Utilizes crumb rubber sized to 20-30 mesh which has a relatively high value	**Moderate:** LCAs are mixed depending the study, the process (wet vs. dry mix) and what is considered the base case being replaced by RMA (polymer modified asphalt or regular asphalt)
Playgrounds/ Athletic Fields (GTR)	**Low:** Market is small and has been growing slowly in recent years recent following highly publicized claims linking crumb rubber in athletic fields to cancer.	**High:** Utilizes crumb rubber sized to 10-20 mesh which has a relatively high value	**High:** LCAs indicate significant environmental benefits compared to virgin synthetic rubber. Numerous studies indicate that toxic compounds that may be present are not bio- accessible and are unlikely to leach toxins into the environment.
Backfill/Civil Engineering (TDA)	**Moderate:** This is currently a very small and mostly unknown market, but could grow with expanded education campaign	**Low:** Relies on chipped and shredded tires which has a relatively low value	**High:** Comparative LCAs show significant benefits compared to use of sand and gravel
Molded and Extruded Products (both GTR and MRP)	**Low:** Markets where it is easy to use recycled tire rubber are largely saturated. Expanding to new markets takes time and required investment in R&D	**High:** Relies on fine crumb rubber which has a high market value.	**High:** Numerous LCAs show positive environmental benefits across a wide range of environmental impact areas
Pyrolysis (rCB)	**Low:** It is yet to be proven that pyrolysis of tires can be profitable on a large scale	**High:** Primary outputs include oil and gases used as fuels and carbon black, which have relatively high market values.	**High:** Generates clean burning fuels once impurities are separated, and eliminates the need for combustion to create new carbon black.

Source: Todd Pollak, U-M Ross School MBA, "Advancing a Circular Tire Economy in Michigan: An Analysis of End Use Markets and Environmental Considerations," August 15, 2019

EXHIBIT 2: SWOT DIAGRAM

10.22.2019 EGLE SCRAP TIRE ADVISORY COMMITTEE (STAC) MEETING

STRENGTHS

(vis-a-vis other states and/or EGLE objectives)

- Remediation – steady progress since 1991
- Overall scrap tire management process
- Fundamental knowledge ("we know the material")
- EGLE outreach beyond Michigan
- Good effective use of the funds
- Strong foundational base of in-state processors

WEAKNESSES

- Michigan's ability to adapt to market changes
- Michigan promoting new markets
- Auto OEM and supplier involvement in research and funding to support scrap tire markets
- Lack of collaboration among agencies, private sector, and states
- Education and knowledge among varied stakeholders (laws and rules, costs, markets)
- MDOT is "cash-strapped," risk-averse
- Processors very reliant on tipping fees (which are determined by market)
- Tire retailers and producers are "absent"
- Collecting and hauling is logistically challenged "north of the knuckles"

S W O T

OPPORTUNITIES

- Priorities with Whitmer administration (e.g. environmental and "fix-the-roads")
- Home base for automotive OEMs and suppliers (e.g. to promote use of molding and micronized rubber)
- Pyrolysis (for producing rCB) getting closer to commercial viability
- Market solutions outside of the state
- RMA can save money vs. traditional asphalt (dry mix, balanced mix)
- Get TDA into the code
- Climate change actions (if such efforts as fossil fuel reductions and deforestation campaigns cause greater emphasis on rCB and rubber reuse)

THREATS

- Recycling priorities more focused elsewhere, such as for plastics
- Polymer "colony" has greater influence on asphalt market
- MDOT priorities are not directed toward developing scrap tire markets (although if RMA cost-benefits are real, then mutual EGLE/MDOT benefits can be realized)
- A decline in tipping fees prior to market transformation would create processor hardship
- Lack of time – trends away from TDF have been apparent for many years, but alternative markets in Michigan are still behind
- Climate change actions (if it compels TDF decline before new scrap tire markets can be developed)

EXHIBIT 3: SCRAP TIRE ECONOMIC VALUE (STEV)

BASED ON MICHIGAN SCRAP TIRE VOLUME

	Revenue/ton	Michigan 2018	National 2018	National aspiration
TDA	$30	6%	8%	20%
TDF	$30	68%	40%	20%
RMA	$270	0%	405	20%
CR	$500	6%	205	30%
Other/export	$50	10%	13%	5%
Landfill	($100)	10%	15%	0%
Steel	$250	0%	0%	5%
rCB	$760	0%	0%	5%
STEV ($mil)		$4.76	$11.76	$24.39

Assumptions: Annual Michigan scrap tire volume -- 10 million; reuse yield -- 90%; excludes tipping fees

APPENDICES

- Interviews
- Research Sources
- Michigan Scrap Tire Market Participant Directory
  (A subset of a larger directory containing information about 13 Midwest states)

Photo Credit: Pexels

INTERVIEWS

Public Sector:

- Blake Nelson – Minnesota DOT
- Lori Freeman – Indiana Environmental Management
- Mel Pins – Iowa DNR
- Ruth Johnston – Nebraska DEQ
- Casey Lamensky – Wisconsin DNR
- Ken Powell – Kansas Health & Environment
- Emery Weins – Kansas Health & Environment
- Jessica Reeves – Kansas Health & Environment
- Dan Fester – Missouri DNR
- Klrk Mitchell – Missouri DNR
- Channon Cohen – Ohio EPA
- Kelly Jeter – Ohio EPA
- Todd Marvel – Illinois EPA
- Rhonda Oyer – Michigan EGLE
- Kirk Johnson – North Dakota
- Brian Walsh – South Dakota
- Jeff Spencer – Michigan EGLE
- Kirsten Clemens – Michigan EGLE
- Brian Chomas – Michigan MDOT
- Mark Birkmeier – Michigan MEDC

Photo Credit: Pexels

INTERVIEWS (CONT.)

Private Sector:

- John Sheerin – USTMA
- Mary Sikora – Recycling Research Institute / Scrap Tire News
- Barry Takallou – Crumb Rubber Manufacturing
- Maureen Kline – Pirelli
- Ashley Fahey -- Goodyear
- Lavon Detweiler – Entech
- Neal Frey -- Entech
- Mike Demski -- Deerpath
- Doug Carlson – Liberty Tire
- Amy Brackin – Liberty Tire
- Red Clark – Asphalt Plus
- Monte Niemi – First State Tire
- Terry Gray -- TAG Resource Recovery
- Ross Bentsen – Getipass (Illinois Tollway)
- John Lavallee – State Testing (Illinois Tollway)

Research Universities:

- Dana Humphrey – University of Maine
- Barbara Dai – Michigan Tech University
- Zhanping You – Michigan Tech University

Photo Credit: Unsplash.com

SOURCES

- Advancing a Circular Tire Economy in Michigan, An Analysis of End Use Markets and Environmental Considerations, Todd Pollak, 2019.
- CTE Lessons for US from EU, Rashmi Ravindranath, Kyle Meagher, Baylee Miller
- EGLE annual reports
- Scrap Tire Handbook, EPA Region 5, October 1993.
- Profile of The Rubber and Plastics Industry, EPA Office of Compliance Sector Notebook Project
- IBISWorld Industry Report, Tire & Rubber Recycling in the US, September 2018
- Washington State Department of Ecology
- Scrap Tire Report, Solid Waste and Financial Assistance Program, Publication # 02-07-029, December 2002
- Ohio's Scrap Tire Cleanup Program, Guidance Number 651, Ohio Environmental Protection Agency, June 2016
- Rubber Modified Asphalt Technical Manual, Ontario Tire Stewardship, 2012
- Waste Tire Recycling Programs, Connecticut Office of Legislative Research, 2014-R-0276

Photo Credit: Unsplash.com

SOURCES (CONT.)

- 'US Trends in Rubberized Asphalt,' Liberty Tire.
- Click to Recycling,' presentation to Recycled Rubber & Plastic Products Technology Conference, September 2019.
- Rubberized Asphalt Guide, Liberty Tire.
- Framework for Balanced Mix Design, NCHRP 20-07/Task 406, National Cooperative Highway Research Program, National Center for Asphalt Technology, Auburn University.
- Review of the Human Health & Ecological Safety of Exposure to Recycled Tire Rubber found at Playgrounds and Synthetic Turf Fields, Cardon ChemRisk, 2013.
- 2017 US Scrap Tire Management Summary, USTMA, 2018
- Managing End-of-Life Tires, World Business Council for Sustainable Development, 2008.
- End-of-Life Tires, A framework for effective management systems. World Business Council for Sustainable Development, 2010.
- Waste Tire Market Development Program Evaluation Final Report, CalRecycle, September 2010.
- Scrap Tires: Handbook on Recycling Applications and Management for the U.S. and Mexico, November 2010

SCRAP TIRE MARKET PARTICIPANT DIRECTORY

Final Report | January 2020

EGLE

MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

SCRAP TIRE MARKET PARTICIPANT DIRECTORY

MICHIGAN

MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

MICHIGAN

COMPANY	ADDRESS	PHONE NUMBER(S)	GENERAL EMAIL	WEBSITE	CONTACTS	COLLECTOR/ TRANSPORTER	PROCESSOR	RUBBER REPROCESSOR	FUEL USER	RUBBER MODIFIED ASPHALT (RMA)	MATERIALS & TECHNOLOGY SUPPLIERS	MTS SUBCATEGORIES	RECYCLED RUBBER PRODUCTS	RRP SUBCATEGORIES	ADDITIONAL INFORMATION
ACI Plastics Inc.	2945 Davison Road, Flint, MI 48506	(888) 768-6224 OR (810) 767-3800		www.aciplastics.com	Scott Melton; smelton@aciplastics.com						X	Compounding			Compounder, processor and reyclcer of engineered thermoplastics. Also offer closed loop reyccling, consulting and lab testing services.
ADCO Products, Inc.,	4401 Page Ave, P.O. Box 457, Michigan Center, MI 49254	(517) 764-0334		www.adcocorp.com							X	Rubber Materials			Adhesives, cements, bonding agents.
American Recycling Center, Inc.	655 Wabassee Drive, Owosso, MI 48867	(989) 725-5100		www.americanrecycling.com	Alex Dawe; alex@americanrecycling.com			X							Ambient grinding of tread, buffings, butyl, EPDM, SBR, NBR, natural rubbers into 1/4", 3/8"; 10, 20, 30 mesh crumb. Use ASTM specs.
CM Rubber Technologies Inc.	4602 West Saginaw, P.O. Box 136, Coleman, MI 48618	(989)465-0200	info@cmrubberrecycling.com	http://cmrubberrecycling.com	Rebecca Mullins	X	X								collect, shred, dropp-off accepted and end-products include crumb rubber, mulch, playground surfacing, equestrian footing, and 2" drainfield aggregate
Cobalt Holdings LLC	1111 N. Centerville Road, Sturgis, MI 49091	(269) 651-3681		http://cobaltrubber.com	Luis Rosado; lrosado@cobaltrubber.com	X	X								Collect, shred, and grind into crumb rubber
Deerpath Recyclers Inc.	56625 Woodhouse Drive, P.O. Box 7, Dowagiac, MI 49047	(269) 782-7232	info@deerpathrecyclers.com	https://www.deerpathrecyclers.com	Michael Demski, VP	X	X								Hauler, collection site, and mobile shredding services into crumb rubber, playground materials, mulch, septic chips, and TDF. Also, sells used tires.

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E & D Engineering LLP	1391 W. M-61, Gladwin, MI 48624	(989) 246-0770	edeng@ejourney.com	www.edengmachine.com							X	Mold Manufacturers			Machining and mold-building; design engineering services.
Environmental Rubber Recycling, Inc.	6516 N. Dort Hwy., Flint, MI 48505	(810) 789-1222 OR (810) 240-9833		https://recyclesearch.com/profile/37054	Bud Dingus; bdingus@frontistar.com	X	X								Collect, sort, and process into TDF. Tire pile remediation.
First Class Tire Shredders	7302 W. Vienna Road, Clio. MI 48420	(810) 639-4466	1stclass@centurytel.net OR firstclassfirm@yahoo.com	http://www.fcshredsandsales.com	Harry Powell, Owner	X	X								Registered site and hauler, shred on premises, and servies in route's with trailer drops and dock personnel for delivering.
Genesee Power Station	G5310 N. Dort Highway, Flint, MI 48505	(810) 785-4144							X						Primary Fuel: wood biomass, tire fuel: tdf
Grayling Generating Station	440 W. Four Mile Road, Grayling, MI 49738	(989) 348-4575							X						TDF, capacity: 4,300 tons/yr
Green Polymeric Materials Inc.	6031 Joy Road, Detroit, MI 48204	(313) 933-7390	contact@gpmaterials.com	www.gpmaterials.com									X	Automotive parts	Manufacture and supply polyurethane recycled rubber-based components and materials for the automotive and transportation industries.
Hillman Power Co.	750 Progress St., Hillman, MI 49746	(989) 742-4571 ext 13			Keith Mulka, Plant Manager				X						Tire fuel: 2" x 2" nominal TDF, capacity: 7,000 tons/yr, primary fuel: wood

MICHIGAN

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Huffman Rubber, Inc.	7510 25 1/2 Mile Road, Homer, MI 49245	(517) 568-3353	huffmanrubber@voyager.net		Alan/ Kevin Huffman	X	X								Collect, Sort, shred, haul and process into crumb -10, -20, -30 mesh, TDF 2" nominal, used tires, and casings.
Huntsman Polyurethanes	2190 Executive Hills Blvd., Auburn Hills, MI 48326	(248) 322-7300		www.huntsman.com							X	Rubber Materials			Manufacture MDI-based polyurethane products which can be used in the formulation of adhesives for scrap tire rubber applications
IMG Inc. New Life Surface Solutions	777 Industrial Park Drive, Shelby, MI 49455	(888) 755-0997	support@liquidpotholefiller.com	liquidpotholefiller.com	Marilyn Arnold								X	Miscellaneous	Developed R4Formula liquid repair filler with a 100 percent recycled rubber blend of aggregates and tire crumb rubber.
International Recycled Products LLC Carefree Distributors	2805 Van Horn, Trenton, MI 48183	(866) 610-0477 OR (734) 675-4745		internationalrecycled.com	Ed Turek								X	Playground mulch	TireTurf sport field and molding crumb rubber, playground and landscaping surfacing, horse arenas, asphalt rubber. Use ASTM specs.
Larry's Tire Inc.	9500 Youngman Road, Lakeview,, MI 48850	(989) 352-5322		larrystirelakeview.com	Larry Cole	X	X								Hauler and scrap tire collection site, end-products are used tires.
Linwood Tire Recycling LLC	14930 Linwood Street, Detroit, MI 48238	(313) 355-4059	info@linwoodtire.com	linwoodtire.com		X	X								Collect, haul, shred into crumb rubber, rubber mulch, and used tires.

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Mensch Manufacturing	2499 S. Highway M37, Hastings, MI 49058-0418	(269) 945-5300	info@menschmfg.com	menschmfg.com	Donald L. Mensch								X	Agricultural parts	Manufactures rubber manure scrapers and feed alley scrapers used on agricultural equipment from scrap bias ply OTR tires.
Porous Pave Inc.	4385 East 110th Street, Grant, MI 49327	(888) 448-3873 OR (231) 834-5537			Connor Ouwinga; connor@porouspaveinc.com								X	Pour-in-place	Manufacture and install porous pave surfacing made from recycled tire rubber, aggregates and a special single component urethane.
Silver Lining Tire Recycling, LLC	3776 11th Street, Wyandotte, MI 48192	(734) 324-4800	silverlining@wyan.org	silverliningtirerecycling.org	Brian Radtke, general manager	X	X								Pick-up and delivery, shred tires, and the end-products are TDF and used passenger tires.
TES (Tondu Energy Systems) Filer City Generating Station	P.O. Box 12, Filer City, MI 49634	(231) 723-6573			J. Scott Wing				X						Capacity 25,600
Timberland Tires	5350 Birch Pointe Drive, Interlochen, MI 49643	(855) 432-1386	info@timberlandtires.com	timberlandtires.com									X	Footwear	Manufacture tires specially formulated for recycling the tires at the end of their useful life into the outsoles of Timberland shoes and boots.
Treadstone LLC (MI)	1720 Terminal Road, Bldg. E, Niles, MI 49120	(269) 591-7950		treadstonellc.com	Mark Sanderson; msanderson@treadstonellc.com			X							Buff recycled tires creating primarily plus four size rubber buffing. Crumb rubber / powder; forklift tire processing; mulch / landscaping products; playground mulch; equestrian.

MICHIGAN

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Truck Away	101 South M-553, Gwinn, MI 49841	(906) 346-3105			Justin Yelle, owner	X	X								Hauler and scrap tires clean- ups. Provide feedstock fro shredders/ recyclers. Collect and recycle used conveyor belting and inner tubes for re-sale to end users and processors. Collect and transport any tire.
Verso Corp. Escanaba MillX	7100 County Road 426, P.O. Box 757, Escanaba, MI 49829	(906) 786-1660			Roger Rouleau, Mill Manager				X						Tire fuel: 2" tire chips. Capacity is 32,300 tons/yr
Viking Energy of Lincoln GDF Suez	509 W. State Street, Lincoln, MI 48742	(989) 736-6618			Don Adams, regional fuel manager; (231) 825-2772				X						Capacity is 10,800 tons/yr.
Viking Energy of McBain GDF Suez	6751 W. Gerwoude Drive, McBain, MI 49657	(231) 825-2772			Don Adams, regional fuel manager.				X						11,300 tons/yr.
Waddle's Tire Service, Inc.	20156 Sibley Road, Brownstown, MI 48193	(734) 283-1644		waddlestire.com	Keith Waddle, president; keith@waddlestire.com	X	X								Collect, sort used tires, and casings, and then haul scrap tires to TDF processors.
Warehouse Tire	1100 Cesar E. Chavez Ave., Pontiac, MI 48340	(248) 332-4120		warehousetire.net	Scott Davidson, manager	X	X								Collection site and hauling, end-products is used tires.

RRS recycle.com

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