An Analysis of the Economic & Environmental Benefits
for Fleet Operators and the U.S. Government

RETREAD TIRES IN THE U.S. AND CANADA

A JOINT REPORT BY
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July 2018

THE IMPORTANCE OF RETREADING

RETREAD TIRES HAVE LONG PLAYED AN IMPORTANT ROLE IN SUPPORTING THE U.S. & CANADA TRANSPORTATION SECTOR.

RETREADS, as they are commonly referred to, offer a reliable, environmentally friendly solution for medium- and heavy-duty commercial fleets to extend the life of their tires, often by 200 percent or more. In addition to helping to generate cost savings of more than $3 billion (USD) annually for fleets, the retread tire industry directly supports more than 51,000 jobs in the U.S. **(IMPLAN Modeling Methodology,** see glossary**)**, and plays a critical role in supporting the broader $28.4 billion (USD) U.S. tire industry in 2016.

THE RETREAD TIRE INDUSTRY DIRECTLY SUPPORTS MORE THAN

51,000 JOBS

IN THE U.S.

THE RETREAD PROCESS, first introduced in 1912, chemically cures a new tread to a used tire. The process, which has evolved from small, rudimentary "shops" to sophisticated, capital-intensive retread manufacturing plants, remains dependent on access to durable, consistent tire cores (or "casings"). Unfortunately, the truck tire retread industry has been affected by ultra low-cost imported tires, which are generally used only once. Such tires are much less likely to be retreaded than other tires designed and manufactured for more premium performance and additional service life through retreading.

The surge in ultra low-cost tires is estimated to have contributed to the closure of more than 450 independently-owned small and medium retread facilities between 2000 and 2016. In addition to lost jobs, the decline of retreading may have environmental implications, as discussed later in this report.

Analysis of the Retread Manufacturing Sector

U.S. & Canada 2016-2017

To help better understand the implications and risks of the shift away from the traditional multiple-life tire business practice (premium tire casing combined with one or more retreads) to the ultra low-cost, single-use tire practice, the research team undertook an analysis of the retread manufacturing sector in the U.S. and Canada between 2016 and 2017. This included technical reviews of existing government, academic and industry reports as well as interviews and input-output economic modeling to quantify the impact and externalities of this market evolution. The main findings are summarized below:

Retreaded tires account for nearly half of all commercial truck and bus tires in the U.S. and Canada.

Today, approximately 44 percent of all commercial tires on the road in the U.S. and Canada are "retread" tires. Approximately 15 million commercial tires are retreaded annually in the U.S. and Canada. Retreads are used by the majority of large fleets (up to 90 percent) in the U.S. and Canada, including the largest private fleets such as Ryder, Penske, UPS, and FedEx, and municipal fleets such as the city of New York and city of Los Angeles.

Retreads are also used extensively by the Department of Defense for both on and off-road vehicles.

Contrary to commonly held beliefs, studies have shown that retread tires offer reliability comparable to new tires in the same tread type and application.

Retread commercial tire safety has been studied by entities including the National Highway Traffic Safety Administration (NHTSA), the American Trucking Associations (ATA) and the states of Arizona and Virginia. In each instance, the findings supported the use of retreaded tires. In examining why commercial truck tires failed, researchers found that the overwhelming cause was improper maintenance such as low tire inflation. On balance, experts have concluded that a well-maintained retread tire offers equivalent reliability to a well-maintained new tire **(Laubie 1999; Woodrooffe et al. 2008)**.

Approximately

44%

of all commercial tires on the road are "retread" tires in the U.S. and Canada.

Approximately

15 MILLION

commercial tires are retreaded annually in the U.S. and Canada.

Retreaded tires are used by the Department of Defense on a range of vehicles.

More than

500

RETREAD MANUFACTURING FACILITIES

throughout the U.S. and Canada provide stable work.

(Modern Tire Dealer, 2017 Facts Issue)

> *When you combine the development of procedures and processes to produce retreads… the quality of the retread has risen to be the equivalent to a normal (new) tire.*
>
> John Woodrooffe, Professor Emeritus, University of Michigan Transportation Research Institute

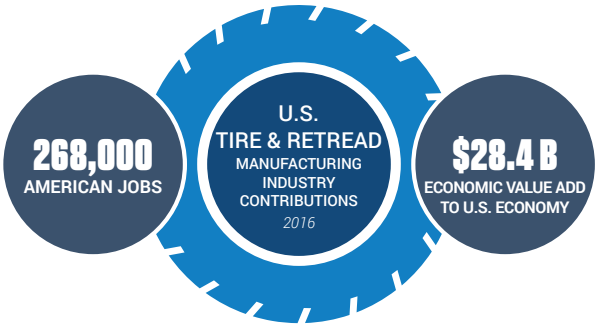
The retread industry plays a critical role in supporting 268,000 jobs that are directly or indirectly attributable to the U.S. tire industry.

(IMPLAN Modeling Methodology)

The more than 500 retread manufacturing facilities throughout the U.S. and Canada generally provide stable work and respectable wages ($11.00 - $15.00) per hour (USD) for hourly roles, as well as multiple salaried roles). The majority of these facilities are independently-owned small and medium businesses (SMBs).

The domestic tire and retread manufacturing industries contributed over $28.4 billion (USD) to the U.S. economy in 2016.

The tire retreading industry is the largest remanufacturing sector in the U.S. with almost twice the number of facilities as the No. 2 sector, motors and generators. **(MIT, 2010)**.



Retreads offer significant environmental benefits vs. ultra low-cost tires used only one time.

A retread tire uses 15 gallons less oil, and approximately 90-100 pounds less total material than a new tire. The U.S. and Canada tire retread industry therefore saves approximately 217.5 million gallons of oil and delivers 1.4 billion pounds of landfill avoidance on an annual basis. In a recently completed life cycle assessment as reported by Ernst & Young (2016) that compared a well-manufactured tire which could be retreaded to that of an ultra low-cost import from Asia, their research found that in Europe the retread tire:

- Reduced CO_2 emissions by 24%
- Reduced natural resource extraction by 70%
- Reduced water consumption by 19%
- Reduced air pollution by 21%
- Reduced land use by 29%

Saves approximately

217.5M

gallons of oil.

Delivers

1.4B

pounds of landfill avoidance

on an annual basis.

Total volume of ultra low-cost import tires has risen

70%

from 2011 - 2015.

65%

Less likely that an ultra low-cost import is retreaded than a more premium tire.

The retread is at-risk:

Of the commercial tire replacement market, the share of retread tires has declined from over 55 percent to 44 percent over the last 20 years **(Modern Tire Dealer, 2017 Facts Issue)**.

The decline in retread tire volume and plant closures has accelerated in recent years as ultra low-cost import tires have flooded the market. The U.S. Department of Commerce has estimated that wholesale prices in the U.S. for an average commercial truck tire imported from China fell from $128 to $102 (USD) from 2014 to 2016, while the total unit volume of these import tires rose 70 percent from 2011 to 2015. In the first quarter of 2017, the Department of Commerce determined that many of these tires are subsidized and sold at less than fair value.

For every premium new tire sold, 1.1 retreads are manufactured in the U.S. and Canada, while less than 0.4 retreads are manufactured for every new ultra low-cost import sold in the U.S. and Canada. It is therefore reasonable to assume that the decline of the retread industry is directly attributable to the growth of ultra low-cost import tires.

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TABLE OF CONTENTS

HOW TO CITE THIS REPORT

Golden, J.S., Handfield, R., Daystar, J. and, J. Woodrooffe (2018).
Retread Tires in the United States & Canada: An Analysis of the Economic & Environmental Benefits for Fleet Operators and the U.S. Government.

A JOINT REPORT

The Duke Center for Sustainability & Commerce
N.C. State Supply Chain Resource Cooperative
The University of Michigan Transportation Research Initiative

ACKNOWLEDGMENTS

Input and funding of this report partially provided by Bridgestone Bandag, LLC in cooperation with industry experts, academia and Bandag franchisees.

The project team wishes to express our gratitude to the technical insights of:

CITY OF NEW YORK
RYDER SYSTEMS, INC.

Additionally, we recognize the efforts of Duke graduate student Koichi Kanaoka on his review of LCA research.

THE MODERN RETREAD PROCESS

WHAT IS RETREADING?

The modern commercial tire retread process, whereby a new tread is applied to a previously used "casing," or tire core, is technologically advanced, highly automated and consistent, and helps fleets safely prolong the life of their tire assets. This is important, given the cost of tires (up to $4,000 (USD) per year for a long-haul truck), making them one of the highest controllable expenses for any fleet, large or small, and an optimal tire program can cut this in half.*

* https://www.thetruckersreport.com/infographics/cost-of-trucking/

THE 10-STEP PROCESS*

Modern retreading includes a 10-step process that requires multiple inspection points and highly automated advanced manufacturing technology.

1 INITIAL INSPECTION

The tire is visually examined using a 7-step rotation to fully analyze if the tire is capable of being retreaded and to identify if there are any repairs that are required.

2 ELECTRICAL INSPECTION

An electrical current is applied to the inner cavity of the tire. A sensor is used to detect any voltage that penetrates the tire, identifying penetrations that may be invisible to the naked eye.

3 SHEAROGRAPHY

In most modern retread facilities, a shearography machine is used to scan the tire from side to side. The machine generates detailed images that are used to identify any underlying damage.

4 BUFFING

The remaining tire tread is physically abraded to remove the rubber and to create a uniform surface upon which the retread will be applied.

5 SKIVING / REPAIR

Repairs are made as needed, including to any damage uncovered during the buffing process.

6 APPLYING CUSHION

An extruder will apply a thin and uniform layer of specialized uncured rubber, called the cushion, over the crown of the casing. Once cured, this material is what secures the new tread to the casing.

7 BUILDING

During the "building" process the new tread is applied - most often by a computer-controlled machine - to the casing.

8 ENVELOPING

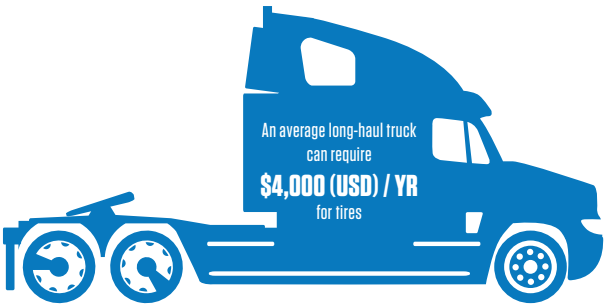
The tire and its new tread are encased in a flexible rubber envelope that will ensure uniform pressure across the surface of the tire, pressing the tread and casing together during the curing process.

9 CURING

The tire tread is cured to the casing using a combination of temperature, pressure and time within a pressurized chamber.

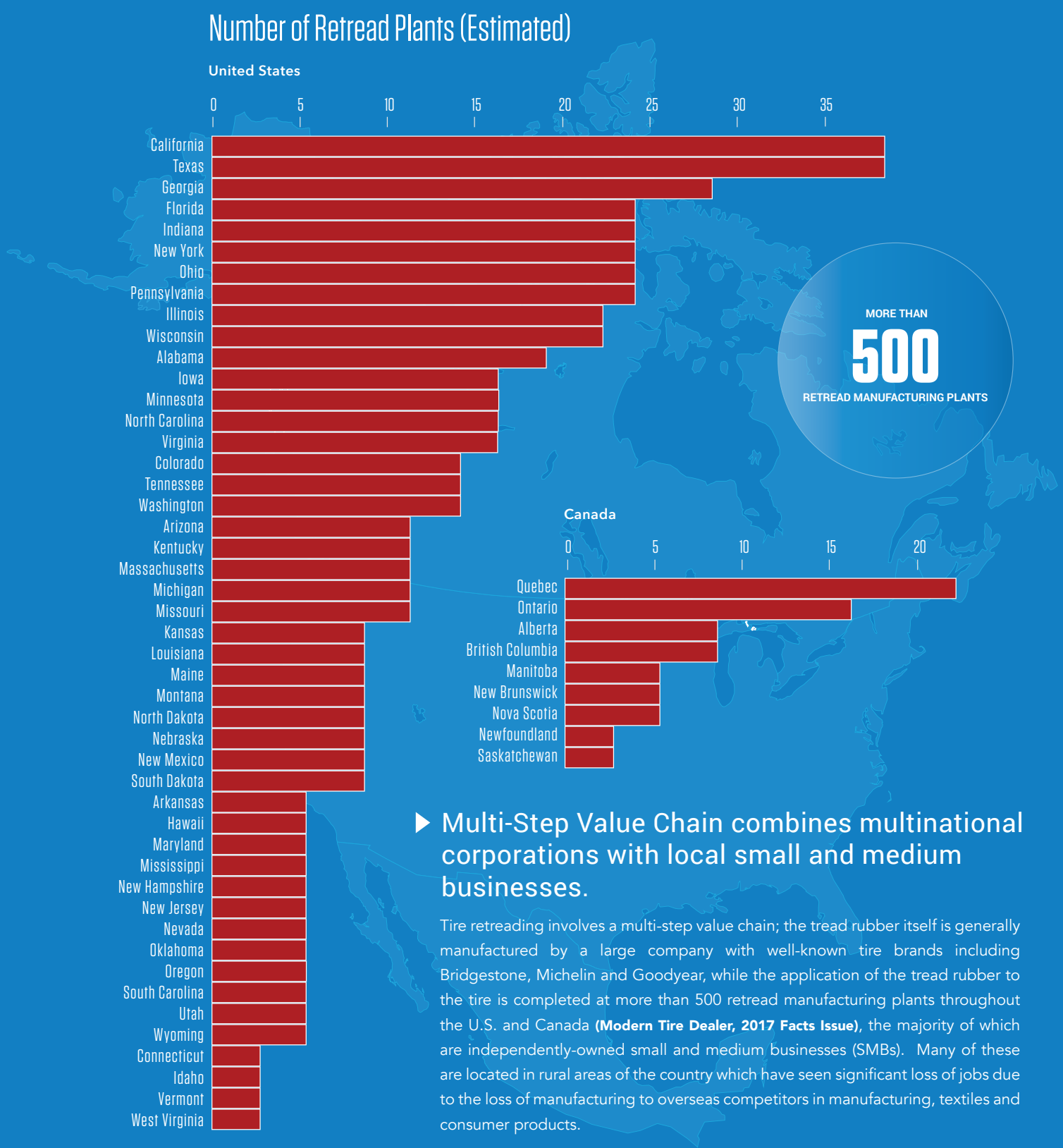
10 FINAL INSPECTION

As a final check, the operator will examine the final product to ensure the quality of the retread. The operator will also verify that the customer specifications are met.



* Source: Bridgestone Bandag, LLC

A NATIONWIDE MANUFACTURING FOOTPRINT



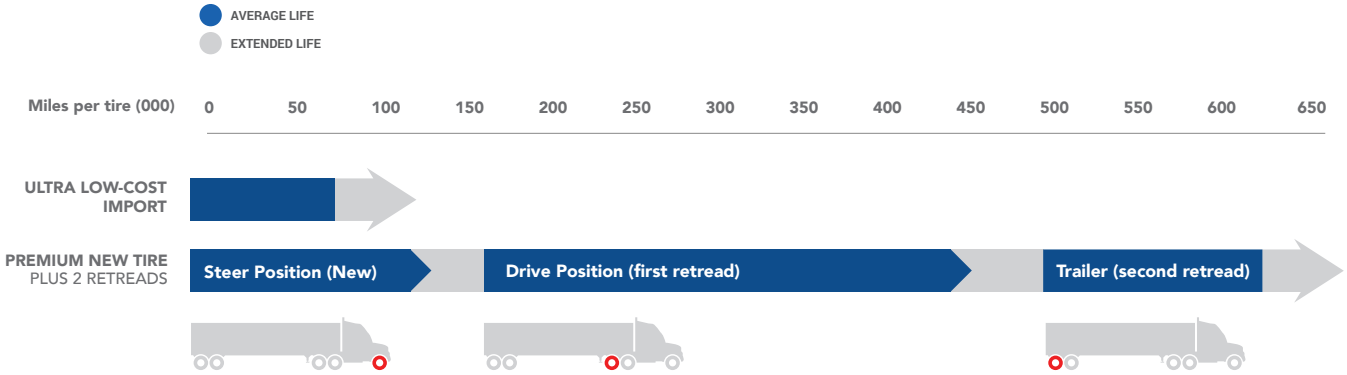
Multi-Step Value Chain combines multinational corporations with local small and medium businesses.

Tire retreading involves a multi-step value chain; the tread rubber itself is generally manufactured by a large company with well-known tire brands including Bridgestone, Michelin and Goodyear, while the application of the tread rubber to the tire is completed at more than 500 retread manufacturing plants throughout the U.S. and Canada **(Modern Tire Dealer, 2017 Facts Issue)**, the majority of which are independently-owned small and medium businesses (SMBs). Many of these are located in rural areas of the country which have seen significant loss of jobs due to the loss of manufacturing to overseas competitors in manufacturing, textiles and consumer products.

RETREADING IS A PROVEN MEANS OF EXTENDING TIRE LIFE

Retreading a premium tire two times can keep a tire on the road up to 500 percent longer than an ultra low-cost tire.

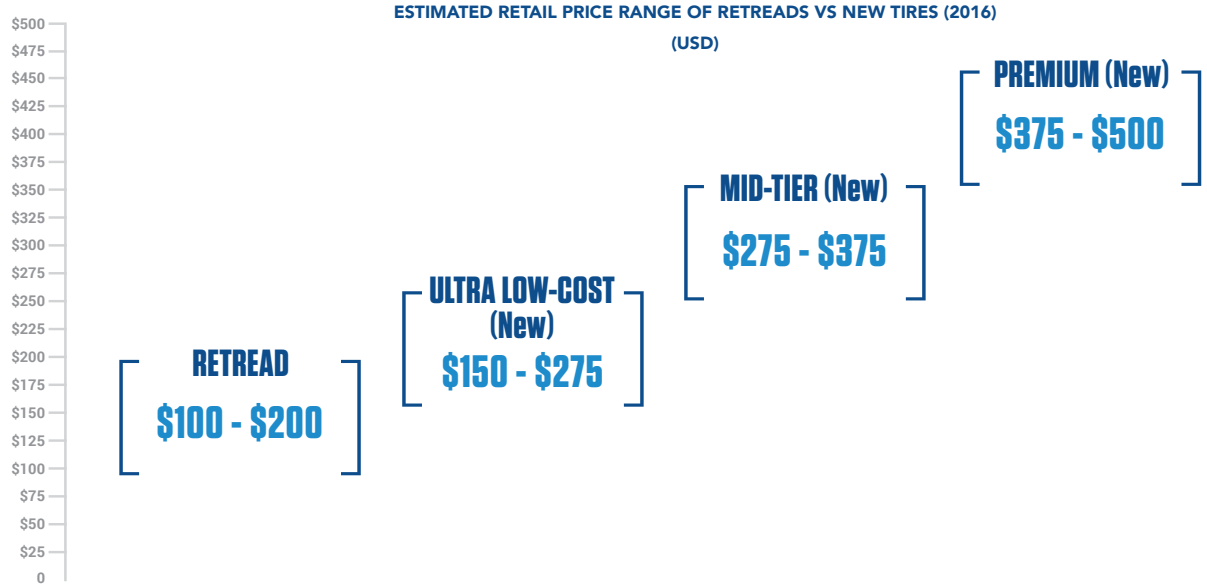
Modern commercial tires are designed to be safely retreaded multiple times, thus extending the useful life of the tire. Many fleets will purchase premium new tires for their "steer" position before retreading them once for the "drive" position and one or more times for the "trailer" position, as shown in the example below. Compared to an ultra low-cost tire that is only used for the "steer" position and then discarded, the premium tire / retread combination can last up to 500 percent longer.



Note: Performance and mileage will vary based on application and operating conditions. The estimates are based on conversations with multiple tire dealers, fleet owners and industry experts and will not always reflect real-world results.

Retreading is also a proven means of lowering fleet costs.

Each time a fleet retreads a well-manufactured and maintained tire, they save more than 50 percent of cost compared to buying a high-quality new tire. Ultra low-cost import tires, which according to International Trade Commission, are likely state-subsidized, are available at market prices that are increasingly competitive with retread tires.



WHO DEPENDS ON RETREAD TIRES?

Private Waste Fleets • Food & Beverage Haulers • Municipal Waste • Fleets Package Haulers • Major Long-Haul Carriers
Large Lease/Rental Fleets • U.S. Army • School Buses • Government Fleets

Retreads are used by the majority of large fleets (up to 90 percent) in the U.S. and Canada, including the largest private fleets such as Ryder, Penske, UPS, FedEx, and municipal fleets such as the city of New York. Retreads are also used by the Department of Defense for both on and off-road vehicles.

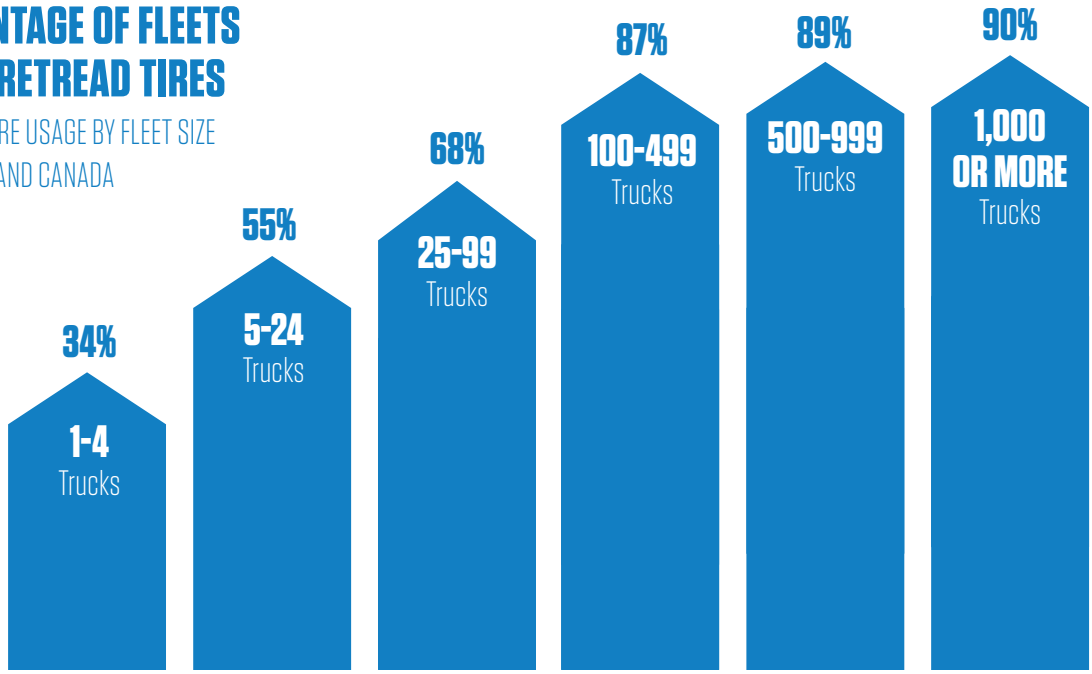
APPROXIMATELY
44%
OF ALL COMMERCIAL TIRES SOLD IN THE U.S. AND CANADA ARE RETREADS.

THIS REPRESENTS ROUGHLY
15 MILLION
COMMERCIAL TIRES / YR

While many small and medium fleets continue to use retread tires, ultra low-cost imports are increasingly displacing retreads at these fleets. As demand for retreading declines and the industry consolidates locations, access to retreading becomes more challenging for fleets in smaller rural markets, further accelerating the shift toward ultra low-cost imports.

PERCENTAGE OF FLEETS USING RETREAD TIRES

RETREAD TIRE USAGE BY FLEET SIZE
IN THE U.S. AND CANADA



RETREAD TIRE RELIABILITY

WHO SAID RETREADS ARE NOT RELIABLE?

The general public holds an overwhelmingly negative view of retreaded tires, often assuming that tire debris on the side of the highway is caused by retreads. This belief has resulted in the widely held idea that retreaded tires are inherently compromised compared to a new tire.

In fact, the safety and reliability of retreaded tires has been studied at least six times over the past two decades, and each study has concluded that retreads do not pose disproportionate safety risks as compared to new tires.

Overview of existing retread tire studies.

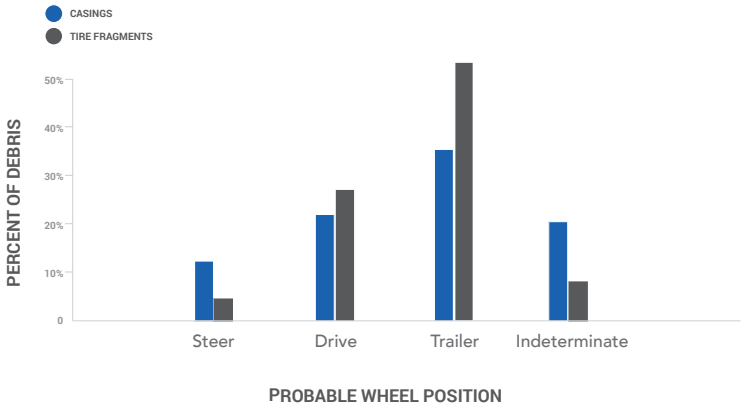
The table below outlines the studies that have been completed in recent years that elucidate the reliability and safety of retreads. Through failure analysis of tire debris collected along roads and highways, researchers consistently found that tire failure causes were consistent regardless of whether a tire was new or retreaded.

STUDY Year	**LOCATION**	**KEY FINDINGS**	**ORGANIZATION** Performing | Sponsor
Rubber on the Road 1995 & 1998	National	The proportions of probable failure causes for retread tires showed a similarity to the failure proportions for OE (new) tires.	Technology Maintenance Council ATA
Vehicles / Transportation Retreaded Tires 1999	Virginia	The quality of materials and methods of producing retreaded tires are not major factors in the problem of tire debris along the highways. Of the tire debris items analyzed, only one case was linked to manufacturing error in the retread process.	Virginia DOT | Virginia General Assembly
Survery of Tire Debris on Metro Phoenix Highways 1999	Phoenix	The ADOT study found that the majority of tire debris assessed originated from passenger cars and light trucks. This finding goes against public perception that the tire debris originates from truck tires.	Jason Carey ADOT
Longevity of Commercial Tires 2000-2006	National	The majority of tires had at least one retread while some had up to five. The data alludes to robust construction of OE tires for multiple retreads and repairs. Supporting the use of retreads as means of extending tire life.	Bridgestone/ Firestone
Commercial Medium Truck Tire Debris Study 2007	National	The proportion of tire debris from retread tires and OE tires is similar to the estimated proportion of retread and OE (new) tires in service.	University of Michigan Transportation Research Institute NHTSA www.nhtsa.gov
Tyre Debris Study 2015-2017	U.K.	The greatest contributors to tyre failure while in service are road hazards (impacts, penetrations, cuts). This study supported previous analysis from NHTSA/Univ. of Michigan Transportation Research that tire maintenance and care are critical to any tire reliability.	Bridgestone Europe

National Highway Traffic Safety Administration (NHTSA) study.

In the most well-known and cited study for retread reliability, the NHTSA and the University of Michigan Transportation Research Institute (UMTRI) conducted a survey of 85,000 pounds of scrap commercial tire debris and 300 tire casings. Each sample was analyzed to determine tire type (new or retread) and failure cause. The study concluded that road hazards and poor maintenance were the primary causes of failure. This confirms the key finding of previous studies: The majority of the tire debris found on the nation's highways is not the result of the retread process, but rather tires that are not properly maintained. The data also corroborated the statistical representation of tires in the field showing a 60/40 split between new and retread tires.

CASINGS AND TIRE FRAGMENTS PROBABLE WHEEL POSITION

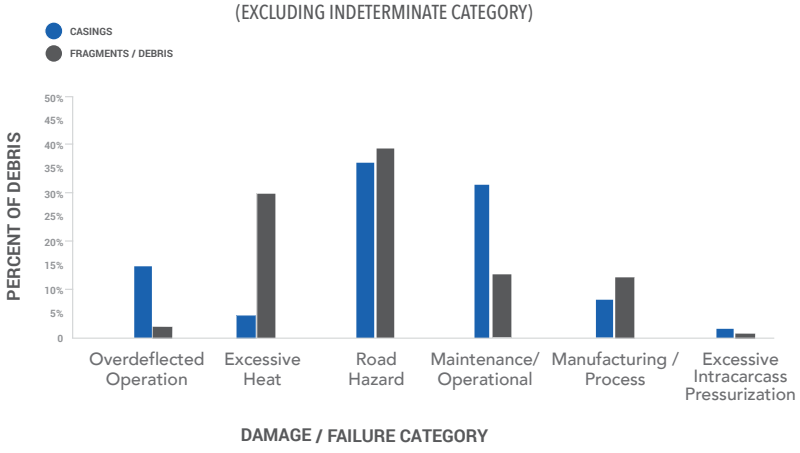


KEY FINDINGS

Among the tire fragments and casings collected from roadside debris a tire positioned at the trailer was found more often than tires in other positions, likely due to poorer maintenance practices on trailer tires than on tires in other wheel positions.

TIRE CASINGS AND FRAGMENTS DAMAGE / FAILURE CATEGORY DETERMINATION

(EXCLUDING INDETERMINATE CATEGORY)



KEY FINDINGS

The majority of tire damage and resulting failures are related to road hazard followed by maintenance/operational issues that directly influence tire failures on the road.

> "Examination of tire fragments and tire casings (where the OE or retread status was known) found that road hazard was the most common cause of tire failure, at 38 percent and 36 percent respectively."
>
> Woodrooffe, J.

THE ECONOMIC IMPACT OF RETREADING

The U.S. Economy

The decline of the American manufacturing sector has been well documented. Automation, lower labor rates, and foreign state-subsidies have all placed the American laborer at significant disadvantage. And while this problem is not new, the dramatic decline of certain import tire prices over the past five years has exacerbated a long-term issue facing the domestic tire industry.

Unlike the ultra low-cost import tire model – whereby tires may be shipped directly from the manufacturer to the end-user - the multiple-life tire model (using retreads) is dependent on a local manufacturing footprint. Directionally, retread facilities must be 150 miles or less from the fleets that they service as greater distances increase turnaround time and logistics costs.

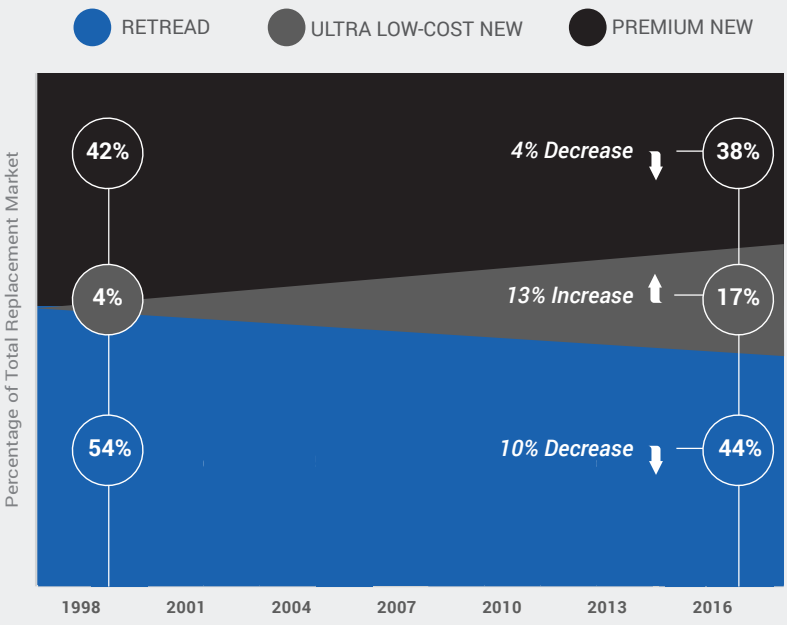
In addition to directly supporting more than 51,000 U.S. jobs **(IMPLAN Modeling Methodology)**, the retread industry indirectly supports thousands of additional employment opportunities. As a poster-child of the circular economy, the multiple-life tire model includes several touch points throughout the process, ranging from labor-intensive work such as tire collection, to support functions such as finance and accounting. By contrast, the ultra low-cost import single-use tire model, an example of the linear economy, negatively impacts not only the retread industry itself but puts at risk the thousands of jobs that the retreading industry indirectly supports.

Economic risks of single-use commercial tires.

The deleterious effect of the single-use ultra low-cost tires on the retread tire industry can be illustrated by the roughly 455 (41 percent) retread plant closures that occurred between 2000 and 2016. This has resulted in about 2,000 direct job losses, with the greatest impact in rural, lower-income regions in the U.S. and Canada. As these retreading facilities are shuttered, it becomes harder for small fleets to access retreaded tires in a timely and cost-effective manner, thereby further increasing dependence on ultra low-cost import tires.

RETREADING HAS DECLINED PRECIPITOUSLY AS A PERCENTAGE OF THE TOTAL REPLACEMENT MARKET

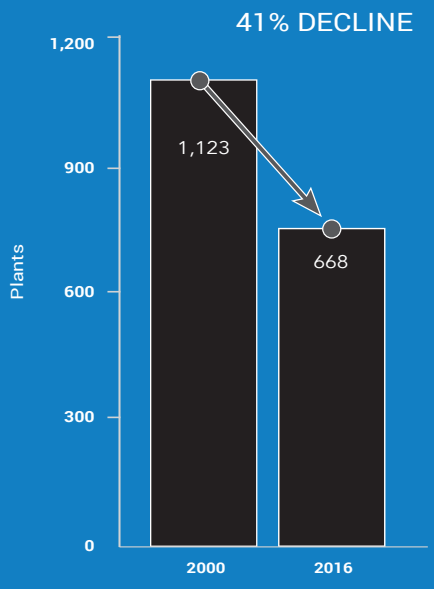
New Replacement Commercial Truck Tires vs Retread Tire Sales (all brands)



Source: RMA, Modern Tire Dealer, Bridgestone

RESULTING IN A DRAMATIC DECLINE IN THE NUMBER OF RETREAD PLANTS

(U.S. & Canada)



ENVIRONMENTAL BENEFITS

BENEFITS OF RETREADING

Throughout each phase of the service life of a retread tire, considerable environmental benefits are derived as compared to the use of an ultra low-cost tire that is used once. In a recently completed life cycle assessment as reported by Ernst & Young (2016) that compared a well-manufactured tire which could be retreaded to that of an ultra low-cost import from Asia, their research found that in Europe the retread tire:

Results:

Reduced CO_2 emissions by	Reduced natural resource extraction by	Reduced water consumption by	Reduced air pollution by	Reduced land use by
24%	**70%**	**19%**	**21%**	**29%**

Similarly, our research found considerable environmental benefits of U.S. assembled retread tires throughout the tire's service life. These include:

Results:

RESOURCE EXTRACTION	MANUFACTURING	USE PHASE	NEXT USE PHASE
Reduces resources required by 66%	Significant reductions in oil, water, energy & emissions	Retread tires can have similar fuel economy as new tires	Lowers the amount of tires that have to be managed

U.S. Example: The Case of a Single 18-Wheel Truck Manufacturing Phase Only			Results
ENERGY FOR A SET OF **18 NEW** COMMERCIAL TIRES **76,770** MJ/TRUCK	VS.	ENERGY FOR A SET OF **18 RETREADED** COMMERCIAL TIRES **24,570** MJ/TRUCK	TOTAL SAVINGS FOR A SET OF **18 TIRES RETREAD 2X** **104,440** MJ/TRUCK

Enough energy to power 29,000 homes for 1 hour

LIFE CYCLE BENEFITS OF A RETREADED TIRE

Resource Extraction

Multiple international studies that used environmental life cycle assessment modeling have shown that the practice of retreading tires rather than replacing with a newly manufactured tire provides substantial reductions in the use of resources. In fact, the results show that a retread commercial tire provides approximately a 96 percent reduction in the use of natural rubber which provides additional savings in water consumption as well as land needed to grow the rubber. It also eliminates the use of additional steel and polyester **(Pecnik & Miller, 2008; Boustani et al., 2010).**

Manufacturing

In addition to the significant reductions in the use of natural resources, U.S. manufactured retread tires also provide additional environmental benefits. For instance, it has been documented that a new commercial tire requires at least 22 gallons of oil to produce. In 2016, there were 7.2 million new commercial tires imported into the U.S. from China alone. If these tires were replaced by well-manufactured, premium tires that can be retreaded at least twice, this would result in more than 216 million gallons of oil being displaced.

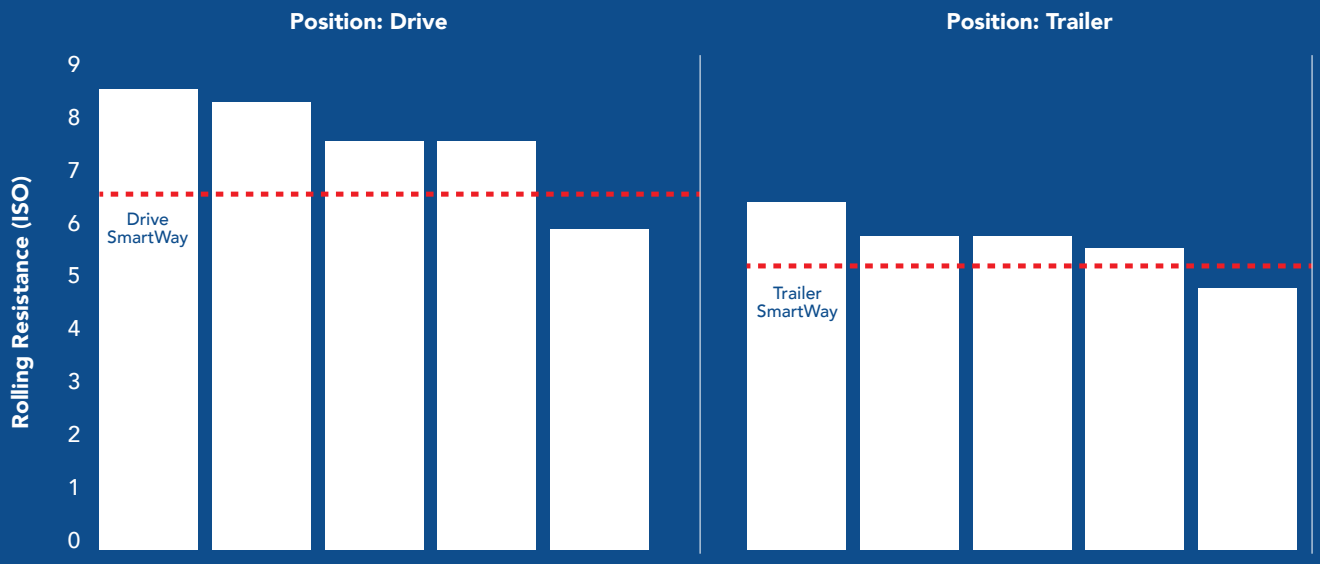
Use Phase

Historically, it was widely believed that retread tires had worse fuel efficiency as compared to new tires. In fact, data presented on AmericaMovesByTruck.com suggests that many retreads actually have lower rolling resistance, and thus superior fuel efficiency, to new tires. Importantly, not only did we find that retread tires are capable of comparable or even superior fuel efficiency to new tires, but there is also evidence that ultra low-cost tires claiming to meet federal rolling resistance guidelines ("SmartWay") may not in fact do so. **(See chart on page 17.)**

Ultra Low-Cost Tires May Introduce Additional Environmental Risks

ISO 28580 testing of ultra low-cost imports showed that many tires claiming to meet the SmartWay rolling resistance target do not actually do so.

ROLLING RESISTANCE TEST OF SELECT ULTRA LOW-COST IMPORTS *



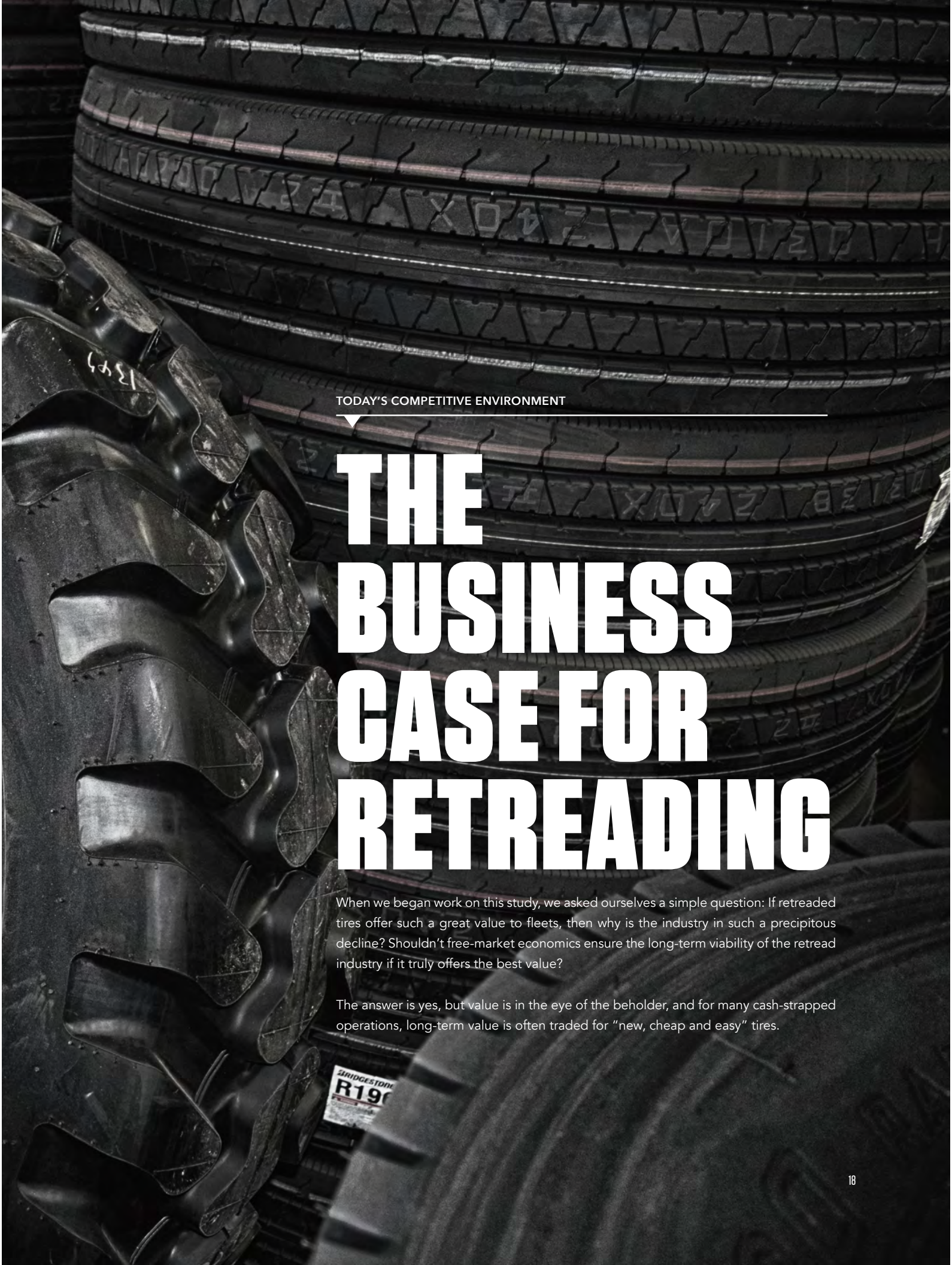
Observation: Of 10 ultra low-cost import drive and trailer tires tested based on the one sample from each brand (Aeolus, Duraturn, Ironman, Hercules, Samson), eight claiming to meet the SmartWay criteria were observed to not do so.

**Smartway requires a minimum sample of three tires to be tested.*
The ISO 28580 test data above is a single-tire test and not the average of three tires.

Next Use Phase

In addition to apparently high rolling resistance, ultra low-cost tires are causing a variety of downstream challenges for rubber recyclers. Gene Walker, CEO of Premier Rubber Company, spoke candidly about the challenges his business is facing as a result of the increase in ultra low-cost import tires.

> *The growth of ultra low-cost import tires has created many challenges for tire recyclers...*
>
> *Perhaps most importantly, we're simply seeing a huge spike in demand for whole-tire disposal - that is, the disposal of a used tire. This is driven primarily by the surge of "single-use" ultra low-cost imports. This can mean good business for tire recyclers, but finding an environmentally friendly solution to dispose of all of these tires is a major challenge. If retreading disappears, we'll see at least three times as many commercial tires per year entering the waste stream."*
>
> **Gene Walker, Premier Rubber Company**



TODAY'S COMPETITIVE ENVIRONMENT

THE BUSINESS CASE FOR RETREADING

When we began work on this study, we asked ourselves a simple question: If retreaded tires offer such a great value to fleets, then why is the industry in such a precipitous decline? Shouldn't free-market economics ensure the long-term viability of the retread industry if it truly offers the best value?

The answer is yes, but value is in the eye of the beholder, and for many cash-strapped operations, long-term value is often traded for "new, cheap and easy" tires.

A BUSINESS STRATEGY

If retreading is a sound business decision, *why are fewer fleets choosing it?*

The long-distance freight industry is characterized by low concentration and relatively low-barriers to entry, with owner-operators accounting for more than 90 percent of industry companies. With high levels of fragmentation and cyclicality, profit margins in the trucking industry are generally low and can vary considerably from year to year. In this environment, cash-flow is critical, and often determines which fleets survive to see another year.

Given the high cost of tires (up to $4,000 (USD) per year for a long-haul truck), small fleets and owner-operators may not have the luxury of investing in premium tires, and may not have the desire to manage a retreading program, even if doing so provides a lower long-term cost.

Interviews with fleet professionals also highlighted how potentially inferior products have made such dramatic inroads into the U.S. and Canada trucking industry. Put simply, the lack of standardized testing and publicly available data - of tire wear performance and rolling resistance - makes tire purchasing a veritable game of chance for small fleet owners, most of whom do not have the time or means to properly compare tire performance across manufacturers.

It's not surprising, therefore, that in the absence of objective information many small fleets and owner-operators choose an inexpensive new tire rather than investing in a premium new tire/retread option that may offer a lower long-term cost.

This lack of standardized and publicly available information, we believe, is a crucial reason for the dramatic rise in ultra low-cost imports, and the prolonged decline of the retread industry. We'll touch more on this issue and potential solutions in the "recommendations" section.

How is an optimal tire program managed?

A tightly managed tire program that maximizes the retread to new tire ratio can drive material savings to any fleet. For example, one of the largest fleets in the U.S. averages approximately four retreads for every new replacement tire purchased.

One of the most important components of retreading is its important role in "good tire management practices," which are widely recognized in transportation industries.

Including original fitment tires, their retread to new tire ratio is 1.65 to 1, as compared to the overall commercial industry average of 0.8 to 1. Through the extensive use of retreads combined with strong maintenance practices, the fleet achieves a tire operating cost that is less than half of the industry average without negatively impacting their tire replacement rate.

Based on our interviews, we found that the most common best practice was for fleets to purchase a premium steer tire, retread the first time for use in the "drive" tire position, and then to retread a second time for use as a trailer tire. Alternatively, the largest privately run fleets in the waste industry often retread their drive tires three or more times.

Two key takeaways emerged from our work that are highly relevant to fleets trying to lower their operating costs:

1 Tires need not be discarded after a single retread.

With the exception of ultra low-cost import tires that are 65 percent less likely to be retreaded at all, we found that if your tire has made it through the inspection process once, it is highly likely to be retreadable a second or third time. This finding is corroborated by interviews with fleet maintenance managers.

2 Retreads can be as fuel efficient - or more fuel efficient - than new tires.

There is a common belief that retreads are not as fuel efficient as new tires, but that is simply not the case. While apples-to-apples comparisons can be difficult, our research indicated that retreading does not make a tire inherently less fuel efficient. In fact, out of more than 300 new and retread tires tested on AmericaMovesByTruck.com, a Bandag brand retread is actually the second most fuel efficient of any tire listed, new or retread. By contrast, as discussed previously, many ultra low-cost import tires that claim to meet certain fuel efficiency thresholds may not.

In summary, the largest trucking fleets in the U.S. - those with dedicated fleet managers and tire procurement professionals- consistently use retreaded tires, while many of the most cost-efficient fleets retread their tires multiple times without increasing their incidence of tire failures.

POLICY RECOMMENDATIONS

As documented in this report, there are significant externalized costs of ultra low-cost import tires, ranging from potential environmental damage to loss of jobs. Offsetting such externalities could be accomplished through government policies that establish positive reinforcements for organizations that act responsibly towards the environment and seek to grow the economy in the markets they sell into.

Below are two possible policy options that we believe can help support the domestic retread industry and help to mitigate the externalized costs of ultra low-cost import tires:

1. Establish new incentives for the production or purchase of retread tires.

Such incentives can target the end-users or the retread producers, and may take the form of a year-end tax credit or a lower sales tax on retread tires. Another possibility is to emulate the aluminum can "deposit/reimbursement" model whereby states charge a higher disposal fee for new tires, and then offset that expense to fleet operators each time the tire is retreaded. For example, a tire disposal fee of $15 might be offset with a $10 state refund each time the tire is retreaded. This would likely be revenue neutral or positive for the state. Such a policy would benefit those fleets with strong retreading programs, and motivate firms not currently doing so to consider these rebates when purchasing new tires.

2. Introduce more stringent policy and third- party verification of tires.

Reinforce compliance of SmartWay with source verification. While this is unlikely to single-handedly stop the growth of ultra low-cost imports, more stringent environmental policies and verification will raise the standard for tires imported into the U.S. and Canada and can help to eliminate ultra low-cost commercial tires that are almost never retreaded.

GLOSSARY OF TERMS

Value Added

The difference between an industry's or an establishment's total output and the cost of its intermediate inputs. It equals gross output (sales or receipts and other operating income, plus inventory change) minus intermediate inputs (consumption of goods and services purchased from other industries or imported). Value added consists of compensation of employees, taxes on production and imports less subsidies (formerly indirect business taxes and nontax payments), and gross operating surplus (formerly other value added). (BEA) Gross value added is the value of output less the value of intermediate consumption; it is a measure of the contribution to GDP made by an individual producer, industry or sector; gross value added is the source from which the primary incomes of the SNA are generated and is therefore carried forward into the primary distribution of income account.

IMPLAN Modeling Methodology

To determine the economic impacts of the retread industry, input/output economic modeling techniques were used. The IMPLAN software with the 2014 U.S. data set was used to determine the value added and jobs supported by the retread industry.

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