U.S. TIRE MANUFACTURERS ASSOCIATION

USTMA Tire Wear Rate Calculations for the United States and California

October 2021

USTMA Tire Wear Rate Calculation – United States

Factor	Tire Type: Passenger Car	Light Truck	Truck/Bus	Notes
Average Weight of Tire (lbs)	26.00	50.60	117.19	Average of actual data from multiple USTMA companies
Tread Weight (lbs)	8.35	16.70	29.64	Average of actual data from multiple USTMA companies
Tread Depth (in)	0.31	0.47	0.56	Average of actual data from multiple USTMA companies
Under Tread (in)	0.08	0.12	0.09	Average of actual data from multiple USTMA companies
Total tread depth (in)	0.39	0.59	0.65	Total Tread depth= Tread depth + Under tread depth
Wear to Depth (4/32 inch for passenger cars and light trucks; 6/32 inch for truck-bus) (in)	0.18	0.35	0.38	USTMA member company engineers recommended using tread depth of 4/32" for passenger and LT tires and 6/32" for truck/bus tires as the average tread depth at removal due to the various factors affecting tire replacement.
Percent tread worn (%)	46%	59%	58%	Percent worn = Wear to Depth / Total Depth
Potential Worn tread weight (lbs)	3.85	9.91	17.33	Worn tread = % tread worn * tread weight
Tread groove void factor (%)	30%	34%	15%	Average of actual data from multiple USTMA companies
Total Worn Tread weight (lbs)	2.70	6.54	14.73	Total Tread Worn = (1-Groove factor void)*Potential Worn Tread Weight
Number of tires shipped	256,410,000	36,930,000	51,320,000	Shipment data included "Radial Industry OE" + "Total Industry Replacement" for 2016, 2017, and 2018 (USTMA Factbook 2020). The average for the three years was used in the calculations.
Distance traveled (miles)	2,478,921,000,000	395,805,000,000	314,077,000,000	The data for the number of vehicle miles driven was found at: https://www.bts.gov/content/us-vehicle-miles. Data was obtained for 2016, 2017, and 2018 and the average for the three years was used in the calculations.
Wear Rate (lb/vmt)	0.000279	0.000610	0.002407	Wear Rate = Total Tread Worn * Number of tires shipped / Distance traveled
Wear Rate (g/km)	0.08	0.17	0.68	Wear Rate (g/km) = Wear Rate (lb/vmt) * 454 / 1.6

** Numbers may not add due to rounding*

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USTMA Tire Wear Rate Calculation – California

Factor	Tire Type: Passenger Car	Light Truck	Truck/Bus	Notes
Average Weight of Tire (lbs)	26.00	50.60	117.19	Average of actual data from multiple USTMA companies
Tread Weight (lbs)	8.35	16.70	29.64	Average of actual data from multiple USTMA companies
Tread Depth (in)	0.31	0.47	0.56	Average of actual data from multiple USTMA companies
Under Tread (in)	0.08	0.12	0.09	Average of actual data from multiple USTMA companies
Total tread depth (in)	0.39	0.59	0.65	Total Tread depth= Tread depth + Under tread depth
Wear to Depth (4/32 inch for passenger cars and light trucks; 6/32 inch for truck-bus) (in)	0.18	0.35	0.38	USTMA member company engineers recommended using tread depth of 4/32" for passenger and LT tires and 6/32" for truck/bus tires as the average tread depth at removal due to the various factors affecting tire replacement. Additionally, this is consistent with California vehicle code 27465.
Percent tread worn (%)	46%	59%	58%	Percent worn = Wear to Depth / Total Depth
Potential Worn tread weight (lbs)	3.85	9.91	17.33	Worn tread = % tread worn * tread weight
Tread groove void factor (%)	30%	34%	15%	Average of actual data from multiple USTMA companies
Total Worn Tread weight (lbs)	2.70	6.54	14.73	Total Tread Worn = (1-Groove factor void)*Potential Worn Tread Weight
Number of tires shipped	27,512,793	3,962,589	5,506,636	Since there is no specific breakdown of tire shipments to CA, the ratio of CA total miles driven to US total miles driven was used to estimate the tire shipments to CA. CA attributed to 10.73% of the total US miles driven. This same percentage was used to determine the CA tire shipments from the total US tire shipments for each category of tires.
Distance traveled (miles)	265,078,000,000	41,311,000,000	34,426,000,000	The data for the number of vehicle miles driven was found at: https://www.fhwa.dot.gov/policyinformation/statistics/2016/vm2.cfm. Data was obtained for 2016, 2017, and 2018 and the average for the three years was used in the calculations. Since there is no specific breakdown of the vehicle miles for passenger car, light truck, and truck-bus vehicles for CA, the percentage breakdown for the total U.S. miles driven was applied to CA total miles driven: 77% passenger car, 12% LT, 10% truck-bus.
Wear Rate (lb/vmt)	0.000280	0.000627	0.002356	Wear Rate = Total Tread Worn * Number of tires shipped / Distance traveled
Wear Rate (g/km)	0.08	0.18	0.67	Wear Rate (g/km) = Wear Rate (lb/vmt) * 454 / 1.6
Annual Total Tread Loss (lbs)	74,221,050	25,909,287	81,106,140	Annual Total Tread Loss = Total Worn Tread Weight per Tire * Number of Tires Shipped
Annual Total Tread Loss (kg)	33,666,075	11,752,246	36,789,096	

** Numbers may not add due to rounding*

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APPENDIX – DATA INPUTS

Data inputs – USTMA Shipment data

Passenger Car

Shipment data included “Radial Industry OE” + “Total Industry Replacement” for 2016, 2017, and 2018. The average for the three years was used in the calculations.

Light Truck

Shipment data included “Radial Industry OE” + “Total Industry Replacement” for 2016, 2017, and 2018. The average for the three years was used in the calculations.

Truck-Bus

Shipment data included “Radial Industry OE” + “Total Industry Replacement” for 2016, 2017, and 2018. The average for the three years was used in the calculations.

Data inputs: Vehicle Miles – United States

- Data sources:
  - The data for the number of registered vehicles was found at: https://www.bts.gov/content/number-us-aircraft-vehicles-vessels-and-other-conveyances.
  - The data for the number of vehicle miles driven was found at: https://www.bts.gov/content/us-vehicle-miles.
- Data years:
  - Data was obtained for 2016, 2017, and 2018.
  - The average for the three years was used in the calculations.

- Annual "vehicle miles driven" data:
  - Source: U.S. Department of Transportation
  - The following categories under "Highway, Total" were used in the tire wear rate calculations:
    - Light Duty Vehicle, Short Wheel Base (all attributed to passenger car tires)
    - Light Duty Vehicle, Long Wheel Base (40% attributed to passenger car tires and 60% to LT tires)
    - Truck, Single Unit 2-axle 6 tires or more (all attributed to truck-bus tires)
    - Truck, Combination (all attributed to truck-bus tires)
    - Bus (all attributed to truck-bus tires)

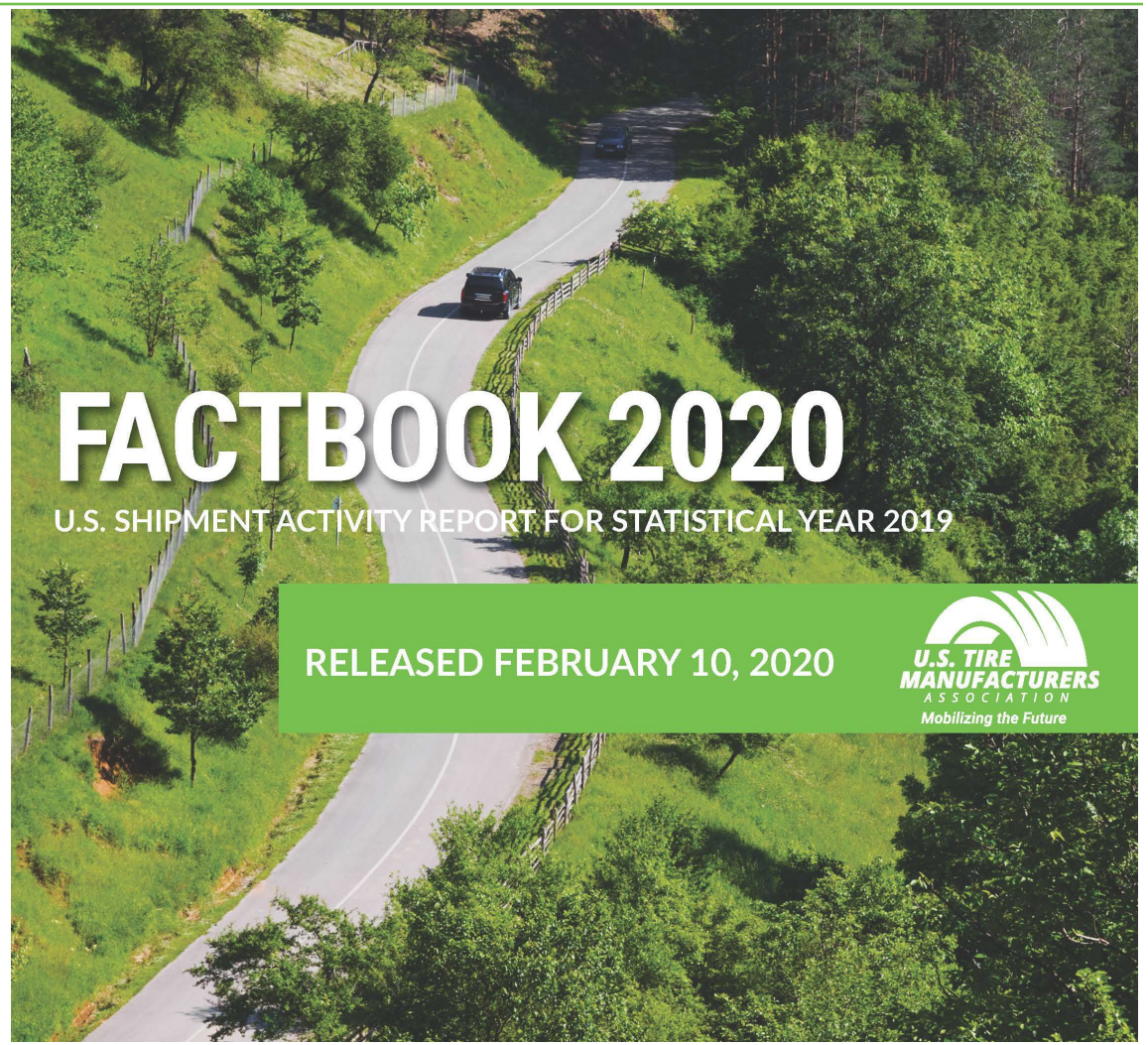
Data inputs: Vehicle Miles – California

- Data sources:
  - "Vehicle miles driven": https://www.fhwa.dot.gov/policyinformation/statistics/2016/vm2.cfm
  - The total vehicle miles driven (total of all rural and urban data) was used for the tire wear rate calculations.
- Data years:
  - Data was obtained for 2016, 2017, and 2018.
  - The average for the three years was used in the calculations.

- The total U.S. miles driven data was applied to CA as there is no specific breakdown of the vehicle miles for passenger car tires, light truck tires, and truck-bus tires for CA.
- The break down for the U.S. data is as follows, based on USTMA tire shipment data (described on next slide):
  - 77% of the total highway miles driven were attributed to passenger car tires,
  - 12% attributed to LT tires, and
  - 10% to truck-bus tires.

Data inputs: Vehicle (tire) segmentation

- Vehicle (tire) segmentation – passenger car, light truck, truck/bus
- Based USTMA shipment data, as found in the USTMA FACTBOOK, for 2016, 2017, and 2018.
- The average for the three years was used in the calculations.



Data inputs: Data collected from USTMA members

1. Average Total Tire Weight and Standard Deviation
2. Average Total Tread Weight and Standard Deviation
3. Average Tread Depth and Standard Deviation
4. Average Undertread Thickness and Standard Deviation
5. Average Tread Void Factor % and Standard Deviation

Data inputs: Tire wear out values

- Most tires are not completely worn down to 2/32” around the entire tire before they are removed from service.
  - USTMA and tire retailers recommend replacement when a tire reaches 2/32” in the fastest wearing groove
  - Tires are typically before this point due to road hazard damage, uneven treadwear and customer needs for tire performance due vehicle type, driving needs, weather conditions, etc.
- USTMA member company engineers recommended using tread depth of 4/32” for passenger and LT tires and 6/32” for truck/bus tires as the average tread depth at removal due to the various factors affecting tire replacement