

Testing validity of tire age removal recommendations

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In early 2000, allegations related to Firestone/Ford Explorer tread detachment failures initiated passage of the Transportation Recall Enhancement, Accountability and Documentation Act, more commonly known as the TREAD Act.

In its August 2007 report to congress, the National Highway Traffic Safety Administration said: "The agency is currently investigating the feasibility of potential regulation to tire aging by analyzing the safety problem, tire aging as a causal factor in crashes, and potential benefits and costs of a requirement for minimum

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performance based on an aging method."

With regard to information behind the Ford six-year removal recommendation, the Tire Industry Association government affairs director said: "Some of the statements made by a top Ford Motor Co. polymer scientist in a 2004 court deposition seem to go against the reasoning that led the auto maker to recommend its vehicle owners replace tires after six years."

The Rubber Manufacturers Association (now the U.S. Tire Manufacturers Association) also opined that "based upon these statements we would submit that Ford doesn't have data showing a direct correlation between tire age and tire performance."

A field evaluation was initiated in which the RMA conducted a "removal from service" tire life study. It included 14,271 tires from five geographic service areas representing seven sites throughout the country. As stated by the RMA, the study intended to develop actual field data that would be reported to NHTSA and help in addressing chronological aging. (Docket No. 21276).

The examination protocol called for two-man teams of trained tire technicians to randomly inspect selected trailer loads of tires that were removed from service and were to be processed by the largest reputable scrap tire operations in each geographic area. Each trailer held about 1,000 "end of life" tires.

The "All Sites Combined Cumulative Remaining Percent" data resulted in a curve (Fig. 1) with no specific age related sudden spike changes in slope to support the current chronological age removal recommendations. This extensive RMA field data report supports NHTSA's posi-

Table 1: Cause of tire removal from service regardless of date code.

Treadwear	About 59%
Road Damage	About 29%
Repairs	About 17%

Table 2: Tires used in this study.

	Rating	Max Inflation Pressure	DOT Date Code	UTQG
Brand A:	94S (112 MPH)	44psi	4511, 4511, 4511 4511	380/B/B
Brand B:	95V (149 MPH)	51psi	2511, 2811, 2811, 2811	560/A/A
Brand C:	94T (118 MPH)	44psi	3611, 3611, 3611, 3611	480/A/B

Table 3: Endurance testing conditions.

	Previous DOT 109 (Reference)	DOT 139 (+ overload steps)
Aging of tire	none	7 weeks/inflated@140F (ASTM)
Ambient Temperature	100F	100F
Inflation pressure	No adjustments	No adjustments
Speed	50 mph	75 mph
Load increments	4 hrs@65% (200 mi)	4 hrs @ 85% (300 mi)
	6 hrs@90% (300 mi)	6 hrs @ 90% (450 mi)
	24 hrs@100% (1200 mi)	24 hrs @ 100% (1800 mi)
DOT Test Complete	1700 miles (34 hours)	2550 miles (34 hours) Load increments to failure after 2550 TC *

*After the 2550 miles of DOT 139 test complete, 300 mile step loading to failure was initiated. (1477#, 1625#, 1773#, 1921#, 2069#, 2217#, 2365#, 2513#, 2661#, 2809#, 2957#, 3105#, 3253#, 3401#, 3549#, 3697#, 3845#, 3993#, 4141#, 4289#, 4437#)

tion of not finding a reasonable basis for a tire removal aging regulation.

The real world RMA "cause of tire removal" as noted in **Table 1** demonstrates that treadwear and road damage and not chronological age are the dominant reasons for tires to be taken out of service.

Unfortunately, these chronological age nonscientific removal recommendations have become the anecdotal narrative for some when attempting to assign blame for a tire tread/belt detachment failure.

From the time of the initiation of the NHTSA rule making process, no hard "removal from service field data" has been presented to the tire industry scientific community supporting the current six-year and 10-year removal recommendations.

Quoting from a chemical analysis peer reviewed report by J. Rancourt of Polymer Solutions: "Based upon the objective science-based testing, the null hypothesis has been shown to be true (that old worn tires retain antidegradants) and the alternative hypothesis (that old tires do not retain antidegradants) has been shown to be false."

In an attempt to support or dispute the legitimacy of the current chronological age removal recommendations, this report initiated an independent, self financed study of aged tread/belt durability (endurance reserve). Aged tires were subjected to high strain extended DOT 139 under 50 percent oxidative and 95 percent inert nitrogen inflation conditions.

Evaluation protocol

Three Tier 1 original equipment P215/60R16 OE approved tires with different speed designations (**Table 2**) were purchased from Tire Rack open inventory.

A mix of 50 percent oxygen, 21 percent oxygen (air) and 95 percent inert nitrogen was compared in each brand. All inflated tires were then oven aged under ASTM conditions (140°F/seven weeks). One tire of each brand was stored unmounted under the same aging conditions to simulate extended warehouse storage. All aging and testing was conducted in a Department of Transportation qualified facility.

This study was designed to quantify aged belt durability reserve under abusive overload conditions (**Table 3**) for a range of design specifications, compounds and manufacturing techniques.

Table 4 summarizes the testing results, which show no tread/belt integrity issues in aged tires after undergoing severe testing conditions.

Conclusions

Aged tires having high oxidative inflation gas exhibited tread/belt laminate integrity that far exceeded the DOT 139 endurance requirement.

The tires featured a range of design and

chemical configurations. They all exhibited high "tread/belt durability reserve" going far beyond the DOT 139 endurance protocol.

This "aged/oxidized durability reserve" study validates the RMA field study of 14,271 tires where the vast majority of end-of-service removal events were not tread/belt detachment anomalies related to age.

No scientific data has been presented to the tire industry scientific community that supports the current OE (six year) or the tire industry (10 year) removal recommendations. The current six or 10 year chronological tire removal age recommendations do not meet scientific standards.

Based on these results, it is my recommendation that chronological age alone should not be presented as a tire safety issue.

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Fig. 1: Cumulative percent for all tires.

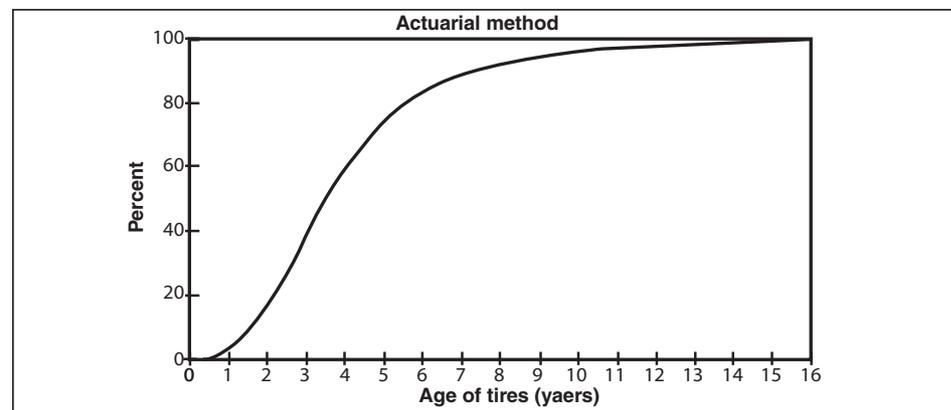


Table 4: Test results.

Brand A	(S speed rating)	Load @ Failure
01	50% O2	5550 mi @ 2957 # load lower sidewall separation, no tread/belt separation
02	21% O2 (air)	6293 mi @ 3401# load lower sidewall separation, no tread/belt separation
03	95% N2	6275 mi @ 3401# load lower sidewall separation, no tread/belt separation
04*	21% O2 (air)	6675 mi @ 3549# load lower sidewall separation, no tread/belt separation
*unmounted "warehouse" during 7 week oven aged		
Brand B	(V speed rating)	Load @ Failure
05	50% O2	5998 mi @ 3345# load lower sidewall separation/air loss, no tread/belt separation
06	21% O2 (air)	4359 mi @ 2585# load lower sidewall separation/air loss, no tread/belt separation
07	95% N2	5883 mi @ 3345# load lower sidewall bubble/separation, no tread/belt separation
08*	21% O2 (air)	5840 mi @ 3193# load lower sidewall separation, no tread/belt separation
*unmounted "warehouse" during 7 week oven aged		
Brand C	(T speed rating)	Load @ failure
09	50% O2	7356 mi @ 3993# load mid sidewall separation, no tread/belt separation
10	21% O2 (air)	7575 mi @ 3993# load shoulder separation, no tread/belt separation
11	95% N2	8252 mi @ 4437# load shoulder chunking, no tread/belt separation
12*	21% O2 (air)	7612 mi @ 3993# load tread/belt separation
*unmounted "warehouse" during 7 week oven aging		