

the parameters discussed in the Notice. Based on the results from these experiments, Ford recommended aging mounted tires with a 50/50 blend of oxygen/nitrogen in an oven for two weeks followed by a peel test to be performed on the tire. They also suggested that it would be more appropriate to test the endurance, high speed, or low pressure performance of a tire aged in this manner.

Ford's observations and conclusions are summarized below:

Results Obtained From Tire

Investigations: (1) There is a very strong correlation between cross-link density and peel strength for all of the manufacturing facilities, (2) peel strength decreases exponentially as, over time, cross-link density increases (as cross-link density increases, the elongation at break decreases), (3) since there is a relationship between cross-link density and peel strength, and also a relationship between peel strength and age of the tire, a relationship between cross-link density and age of the tire should also exist, (4) the evidence that cross-link density exponentially increases over time suggests that skim and wedge rubber is aging oxidatively, and (5) the aging mechanism of spare tires is the same as road tires, oxidative.

Results From NHTSA ODI Report on Firestone Wilderness AT Tires: (1) The overwhelming majority of tires analyzed aged oxidatively in the field and oxidative aging is the predominant mechanism in the reduction of peel strength over time.

Adhesion (Peel) Test: (1) Although peel testing is an important characteristic of tires, the data for Alternative 1 do not support the use of endurance testing as an appropriate aging condition for the tire because the test procedure does not influence the peel strength to any significant degree, i.e., after 24 hours of testing, only a 10% decline in peel strength is affected, while after 50 hours, a 16.8% decrease is measured, (2) the cross-link density of the skim rubber becomes lower as a result of the conditions at which the endurance test is run and this indicates that anaerobic aging due to severe heat and stress is degrading the rubber properties, (3) field aged tires increase in cross-link density with time, not decrease, (4) the wedge properties of the endurance tested tires also show anaerobic aging and this data shows that significant anaerobic aging occurs during endurance testing of this tire, (5) the field data obtained by both NHTSA and Ford suggest aerobic/oxidative aging.

Michelin's Long-Term Durability Endurance Test: (1) The test is not an

appropriate universal aging test because it does not properly age the wedge region of larger tires or tires with a heavier tread mass (in the late 1970s and early 1980s when this test was first developed, tread patterns were more all season than all terrain and the average tire size was smaller), (2) the dynamic aspect of the test is too benign for the nearly 10.5 days of test wheel time required (for passenger car tires, running the tire slightly overloaded (11%) and significantly overinflated (17%—significant because inflation pressure changes have a more pronounced effect than load changes in test wheel tests) at 97 km/h essentially prolongs the test so that oxidative aging can occur but fails to test the belt package in any meaningful way once it is aged), (3) the test is not without merit; the 50/50 oxygen/nitrogen blend does accelerate the oxidative aging mechanism of skim rubber.

Oven Aging: (1) Oven aging tires, either un-mounted or mounted with air, has very little effect on the chemical and physical properties of the belt package rubber; only when mounted with the 50/50 blend do properties significantly change, (2) it is possible, by using the 50/50 oxygen/nitrogen blend, to artificially age tire rubber to the chemical equivalent of 3–4 years in age and, from a chemical aging standpoint, properties of the skim rubber can be aged just as effectively in an oven using the 50/50 oxygen/nitrogen blend as on the test wheel, (3) for oven aging, the wedge rubber ages similar to field-aged tires; contrasting with tires run to the "Michelin" test, which showed severe reversion in the wedge rubber, (4) tires oven aged with the 50/50 oxygen/nitrogen blend are in a condition similar to an older full size spare and, therefore, it may be more appropriate to test the endurance, high speed, or low pressure performance of a tire aged in this manner.

Ford also submitted aging testing results, as well as data regarding the high speed, endurance and low-pressure test. Ford's data have been granted confidential status. Therefore, it is not available for review in the docket. Their recommendations from their high-speed, endurance and low-pressure testing are summarized in the comment summary section of this document.

4. Goodyear Endurance Testing

In a August 2002 presentation to NHTSA and submission to the docket, Goodyear provided the following comments on NHTSA's proposed endurance test based on additional testing conducted by Goodyear: (1) Heat induced damage mode (tread chunking)

exhibited in proposed FMVSS No. 139 endurance testing is not representative of real world failures in the field, (2) tires with proven safe field performance will not pass the proposed FMVSS No. 139 due to tread chunking caused by excessive heat build-up due to high speed on curved surface and high load conditions, and (3) tire design changes/compromises to reduce heat induced tread chunking will negatively impact other safety performance characteristics (e.g., wet traction, wet handling, dry traction).

Based on the aforementioned observations, Goodyear concluded that (1) FMVSS No. 139 on a 1.7m curved surface causes shorter footprint length, high footprint pressures and elevated strain energy resulting in higher tire running temperatures, (2) 65 mph with a 10% load reduction on a 1.7m test wheel yields tire temperatures equivalent to FMVSS No. 139 conditions on a flat surface, (3) a tire that did not pass the FMVSS No. 139 test on a 1.7m test wheel due to tread chunking passed when the test was duplicated on a flat surface.

Goodyear stated that it agrees with the agency the test speed needs to be 75 mph on a flat surface but suggests the following revision to the proposal to correlate the speed to an equivalent speed and load on a 1.7m curved surface: (1) Reduce the load by 10% to 100% at the final load step to effect a 8° F (4.4° C) reduction in the shoulder surface temperature, and (2) reduce the speed 10 mph, to 65 mph, to effect an 9° F (5° C) reduction in shoulder surface temperature. According to Goodyear, the reduced load and speed parameters would reduce heat induced chunking.

V. Summary of Public Comments on NPRM

NHTSA received over 5,000 comments on the March 2002 NPRM. The comments were submitted by: vehicle and tire manufacturers and associations, consumer advocacy organizations and individual members of the public. Substantive comments are summarized below.

A. NHTSA's Proposed Test Procedures

1. High Speed Test

RMA agreed with NHTSA's proposed conditions for passenger tires but believed that adjustments in speed and inflation pressure are necessary for light truck tires to achieve a similar degree of severity as proposed for passenger tires.

ITRA supported the proposal made by the RMA and stated that NHTSA's proposed high speed tests results generally show heat precipitated tread