Update & Review of Tire Issues

Joseph P. Scott, NHTSA

NHTSA
People Saving People
www.nhtsa.dot.gov

TREAD Act

- HR 5164 signed into law on November 1, 2000
- Transportation Recall Enhancement, Accountability, and Documentation (TREAD) Act
- 3 Sections relate to tire performance items (Sections 10, 11, & 13)

Section 10 - Tire Standard Upgrade

- Revise and Update tire standards: FMVSS Nos. 109 and 119
- Rulemaking must be completed by June 1, 2002

Section 11 - Improved Tire Information

Tire Labeling

- Improve labeling for consumers to easily identify tires involved in a recall
- Initiate rulemaking within 30 days
- Complete rulemaking by June 1, 2002

Inflation Levels and Load Limits

- Consumer information on tire load limits
- Consumer information on maintaining proper tire inflation levels
- No statutory deadlines established

Section 13 - Tire Pressure Warning

- Require a warning system in the vehicle to indicate when the tire is significantly under-inflated
- Complete rulemaking by November 1, 2001
- Requirement must become effective 2 years after completion of rulemaking

NHTSA Tire Testing – Phase 1

- Purpose: To focus on developing proposals for a high speed test and endurance test.
- Tested 12 brands with different sizes and speed ratings.
- Shearography analysis before and after testing
- Compared with a baseline FMVSS No. 109 and GTS-2000 proposal

9 P-Metric Tires Tested

• Bridgestone Potenza RE92	P205/65R15	92H
• Pirelli P4000	P205/60R15	90H
• Michelin Energy MXV4	P205/65R15	94H
• Hankook Optimo Plus II	P205/65R15	92H
• Dunlop D65 Touring	P205/70R14	93T
• BFS Futura 2000 ATD	P205/75R14	95S
• Firestone Wilderness AT	P255/70R16	109S
• Cooper National XT 5000	P225/60R16	97S
• Firestone ATX	P235/75R15	105S

3 LT Tires Tested

- Michelin XPC 4x4

  LT235/70R16 105H; Load Range C
- Goodyear Wrangler AT/S

  LT235/75R15; Load Range C
- Yokohama Geolander H/T

  LT225/75R16 110S; Load Range D

NHTSA Tire Testing – Phase 2

- Purpose: To focus on likely agency proposal for a high speed test and endurance test.
- Tested 12 brands with different sizes and speed ratings.
- Shearography analysis before and after testing

8 P-Metric Tires Tested

- Toyo Proxes H4 P225/60R16 97H
- Uniroyal Tiger Paw P225/60R16 97H
- Dunlop D65 Touring P205/65R15 92T
- Goodyear Regatta 2 P205/65R15 92T
- BFGoodrich Cientra Plus P235/75R15 105S
- Cooper Lifeliner II P235/75R15 105S
- Firestone Wilderness AT P235/75R15 105S
- Michelin XH4 P235/75R15 105S

4 LT Tires Tested

- Pirelli Scorpion P/T
  LT235/75R16 104S; Load Range C
- Yokohama Geolander A/T
  LT235/75R15 104S; Load Range C
- Goodyear Wrangler H/T
  LT245/75R16 120R; Load Range E
- Bridgestone R273 SWPII
  LT245/75R16 120Q; Load Range E

Overview of Test Results

- Test results are in the public docket (online at http://dms.dot.gov) NHTSA-2000-8011
- All tires completed baseline Endurance test
- As expected, more failures occurred at higher speed and at lower inflation pressure
- Low pressure test also conducted on some tires that completed endurance test
- All tires passed low pressure performance at 140 kPa (20 psi)

Key Test Results

- All tires completed baseline High Speed test (used parameters specified in GTS-2000 proposal)
- As expected - more failures occurred at combination of high load, low inflation, and long duration
- Failures included: tread separation, belt separation, sidewall blowout, chunking

Bead Unseating: Test Results

Testing to proposed bead unseating wedge test:

- Point of application is more realistic
- Comparison with current bead unseating test method
- 60 tires tested to each procedure
- Results show good correlation between forces to unseat bead in modified FMVSS No. 109 and wedge test

Road Hazard Test: Test Results

Testing to Road Hazard Impact Test:

- Proposed replacement for Strength test
- Based on SAE J1981 recommended practice
- 60 tires with different aspect ratios (55, 65, 75) tested to current test, modified current test, and to SAE J1981
- Only one tire had air loss or damage

Aging Effects: Test Results

Dynamic Aging tests using O_2/N_2 mix as filling gas

- **Tires run for 250 hours**
- **1 of 12 tire brands tested failed**

Oven Aging

- **2 of 12 tire brands tested failed**

Adhesion(Peel) Test – American Society for Testing and Materials (ASTM) D413

- **Adhesion test performed on tires: 1) with no conditioning; 2) after 24-hour test; and 3) after 50-hour test**
- **Trend shows lower peel strength with longer conditioning**

Outline of FMVSS No. 139, the new tire standard

- Light Vehicle Standard for vehicles up to 10,000 lbs GVWR
  - High Speed test: *Upgraded*
  - Endurance test: *Upgraded*
  - Low Pressure Performance test: *New*
  - Bead Unseating test: *Upgraded*
  - Road Hazard Impact test: *Upgraded*
  - Aging Effects test: *New*

High Speed Test: Overview

- Purpose: To evaluate tire performance during high speed operation
- Upgrade: Mainly through higher test speed
- Test Parameters:
  - Speed: 140/150/160 km/h (87/93/99 mph)
  - Inflation Pressure: 220 kPa (32 psi) for P-metric
  - Load: 85% of maximum load rating
  - Duration: 30 minutes at each speed step
  - Ambient: 40°C (104°F)

Endurance Test: Overview

- Purpose: To evaluate tire performance for an extended duration
- Upgrade: Mainly through higher test speed and higher load for a longer duration
- Test Parameters
  - Test Speed: 120 km/h (75 mph)
  - Inflation Pressure: 180 kPa (26 psi): P-metric tires
  - Test Load: 90/100/110% of maximum
  - Duration: 8/10/22 hours
  - Ambient: 40^{o}C (104^{o}F)

Low Pressure Performance Test: Overview (1 of 2)

- Purpose: To evaluate tire performance at TPMS low pressure threshold (New Requirement)
- One of the two alternatives will be selected for final rule
- Test Parameters - Alternative 1
  - Use same tire that completed Endurance test
  - Test Speed: 120 km/h (75 mph)
  - Inflation Pressure: 140 kPa (20 psi):P-metric tires
  - Test Load: 100% of the maximum load rating
  - Duration: 90minutes
  - Ambient: 40°C (104°F)

Low Pressure Performance Test: Overview (2 of 2)

Test Parameters - Alternative 2

- Use same tire that completed Endurance test
- Test Speed: 140/150/160 km/h (87/93/99 mph)
- Inflation Pressure: 140 kPa (20 psi): P-metric tires
- Test Load: 67% of the maximum load rating
- Duration: 30 minutes at each speed
- Ambient: 40°C (104°F)

Bead Unseating Test: Overview

- **Purpose: To evaluate tire resistance to bead becoming unseated from the rim during severe vehicle maneuvers**
- **Upgrade: Mainly through point of application of force**
- **Test: Toyota wedge test**
- **Test parameters**
  - **Force: 2.0 times maximum tire load limit**
  - **Inflation pressure: 180 kPa (26 psi) for P-metric tires**

Road Hazard Impact Test: Overview

- **Purpose: To evaluate tire impacting a road hazard such as a pothole or curb**
- **Upgrade: Mainly through new test method- SAE J1981, *Road Hazard Impact Test for Wheel and Tire Assemblies***
- **Test parameters:**
  - **Inflation pressure: 180 kPa (26 psi) for P-metric tires**
  - **Initial point of striker: 80 degrees to vertical**

Aging Effects Test: Overview

- **Purpose: To evaluate tire performance as a result of aging**
- **New Requirement: Three alternatives proposed for aging effects test; one will be selected for final rule:**
  - **Alternative 1: Adhesion test using ASTM Standard D 413-98**
  - **Alternative 2: Long term durability endurance test**
  - **Alternative 3: Oven aging test**

Aging Effects Test: Alt. No. 1 of 3

- Alternative 1 = Adhesion test evaluates force to separate adjacent belts
- Test Parameters for 24-hr conditioning
  - Speed: 120 km/h (75 mph)
  - Inflation Pressure: 180 kPa (26 psi)
  - Load: 90/100/110 % of maximum load rating
  - Duration: 8 hours at each load
  - Ambient: 40°C(104°F)
- Specimen then used for Adhesion test
  - Minimum Peel strength of 30 lbs/in proposed

Aging Effects Test: Alt. No. 2 of 3

- Alternative 2 = Long term durability endurance test
- Test parameters
  - Test speed: 96 km/h (60 mph)
  - Inflation pressure: 275 kPa (40 psi)
  - Filling gas: 50% O_2 and 50% N_2
  - Load: 111% of maximum load rating
  - Duration: 250 hours
  - Ambient: 40ºC (104ºF)

Aging Effects Test: Alt. No. 3 of 3

- Alternative 3 = Oven aging test
- Oven Aging: 14 days at 75ºC
- Test parameters after oven aging
  - Test speed: 120 km/h (75 mph)
  - Inflation pressure : 180 kPa (26 psi)
  - Test load: 90/100/110% of maximum load rating
  - Duration: 8 hours at each load
  - Ambient: 40ºC (104ºF)

FMVSS No. 139 Effective Date (1of 2)

- Agency proposed two alternatives for effective dates:
- Alternative 1 = with phase-in
  - 2-year phase-in for P-metric tires
  - Would require production data from manufacturers to enforce for Year 1
  - Beginning September 1, 2003: 50% of P-metric tires must meet new requirements
  - Beginning September 1, 2004: 100% of P-metric tires must meet new requirements
  - Beginning September 1, 2005: 100% of LT tires must meet new requirements

FMVSS No. 139 Effective Date (2of 2)

- Alternative 2 = no phase-in
  - No phase-in for P-metric tires
  - Would not require production data from manufacturers to enforce
  - Beginning September 1, 2003: 100% of P-metric tires must meet new requirements
  - Beginning September 1, 2004: 100% of LT tires must meet new requirements

Proposals For Labeling Requirements

- NPRM issued on December 19, 2001
  - NHTSA Docket No. 11157
  - Applicable to vehicles with GVWR <10,000 lbs.
  - Tire Identification Number (TIN)
  - Load Limits/Load Index
  - Maximum inflation pressure
  - Vehicle placard content & location
- Comment period closed February 19, 2002
  - Agency received approximately 40 comments

SUMMARY

Three Tire-related Rulemakings in progress:

1. Labeling NPRM: Published December 19, 2001
   - Comment period closed February 19, 2002
   - Reviewing comments and developing final rule
   - Final Rule due by June 1, 2002
2. TPMS Final Rule: Soon
3. Tire Upgrade NPRM: Published March 5, 2002
   - Comment period closes: June 5, 2002 (extended 30 days from May 6)
   - Agency will proceed to final rule after reviewing all comments