VSR Analysis

TRB-NAS Special Report #286

"Tires and Passenger Vehicle Fuel Economy"

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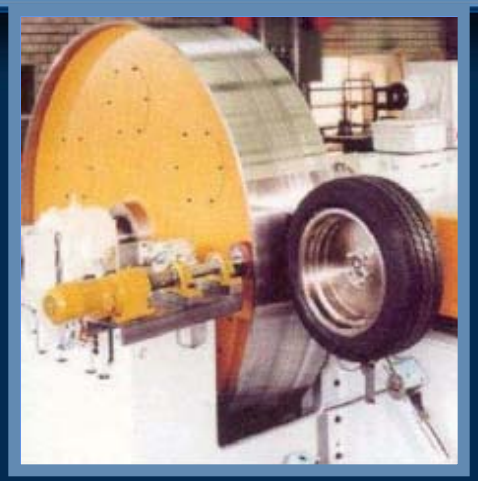
Background

- $500k earmark funded project
  - VSR provided COTRs and technical support
- Study Conducted by NAS
- Various personnel from the agency met with committee and its members

Study Charge and Scope

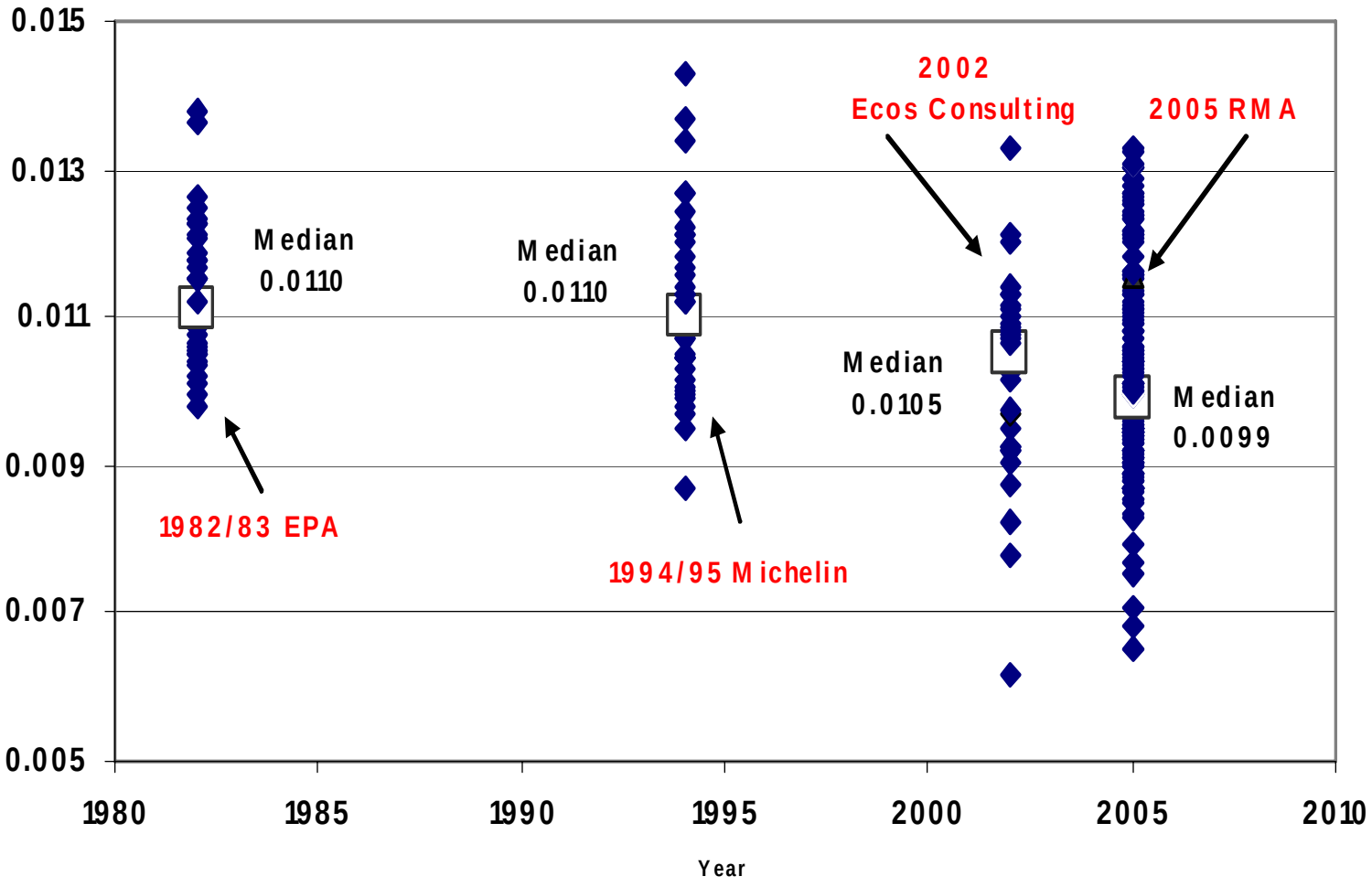
- Evaluate the effect of lower rolling resistance of replacement tires on:
  - Motor fuel consumption nationally
  - Tire wear and scrap tire generation
  - Tire performance characteristics and its impact on safety
  - Total consumer spending on tires and fuel

Measuring Rolling Resistance



- Rolling Resistance Coefficient ("RRC") - rolling resistance force divided by the wheel load
  - RRC is typically measured for new tires only
  - OE Passenger Tires
    - Range: 0.0070 to 0.0095, **Average 0.00838**
  - Replacement Passenger Tires
    - Range: 0.0065 to 0.0133, **Average 0.01020 (22% higher)**
- SAE Test Procedures
  - J1269 (Single speed – 50 mph)
    - Used primarily to assign a rolling resistance value to a tire
  - J2452 (Range of speeds)
    - Used primarily to characterize average tire rolling resistance during typical driving cycles for vehicle emission and fuel economy calculations

Rolling Resistance of Replacement Tire Samples, 1982 to 2005



Summary of TRB-NAS Conclusions

"*A recommendation for congressional action is offered in light of the following conclusions*."
TRB-NAS

TRB-NAS Conclusion #1

- Feasibility of lowering rolling resistance
  - Conclusion #1: Average rolling resistance of replacement tires can be reduced 10 percent
    - OE tires have lower rolling resistance by 10 to 25 percent across all classes of passenger vehicle tires
    - Tire design modifications, new tire technologies, and better tire inflation pressure maintenance could achieve lower RR
    - It is attainable within a decade

TRB-NAS Conclusion #2

- Influence on Vehicle Fuel Economy
  - Conclusion #2: Tires and their rolling resistance affects fuel economy and consumption
    - 10% reduction in the average rolling resistance provide 1 to 2% increase in the fuel economy
    - It saves about 1 to 2 billion gallons of fuel per year nationwide

TRB-NAS Conclusion #3

- Effect on Tire Wear Life and Scrap Tires
  - Conclusion #3: Effect of RR on tire wear life and scrap tires are difficult to estimate
    - Advances in tire technology could reduce RR without adverse effects on tire wear life and scrap volume
    - Reduction of new-tire tread depth of 2/32 (20%) will result in an approximate reduction in rolling-resistance of 10%
      - A 2/32-inch change in tread depth would result in a change in UTQG treadwear of 40 points
      - A 10% reduction in tire wear life costs consumers about $12 more per year
      - The average annual fuel savings estimate is $12 to $24

TRB-NAS Conclusion #4

- Effects on Traction and Safety Performance
  - Conclusion #4: Tire tread can be modified to reduce rolling resistance
  - Traction may be affected but the committee could not.relate it to safety consequences

TRB-NAS Conclusion #4 (cont'd)

- Such consequences may be undetectable.
  - Many tires in the replacement market have UTQG "A" wet traction rating and 10 percent or more lower average rolling resistance
  - *VSR Comments:*
    - Analysis is based on NHTSA UTQG wet traction measurements
    - Need to maintain stopping distance and limit handling capability
    - Lower rolling resistance achieved through lower tread depth would have negative implications for wet and snow traction

TRB-NAS Conclusion #5

- Effects on Consumer Fuel Savings and Tire Cost
  - Conclusion #5: Lower RR of replacement tires will result in fuel savings to consumers
  - Fuel Cost Savings may exceed associated tire purchase cost
  - Needs to ensure tire wear life is not shortened
    - Consumers have no practical way of assessing how tire choices affect vehicle economy

TRB-NAS: How will Consumers Respond?

- The Committee could not assess how individual consumers will respond
  - Each will weigh costs and savings differently
  - No major price differences observed among similar tires with different RR
  - Consumer Information is not available today
  - Lower RR is likely to result from a combination of changes in:
    - Mix of tires purchased by consumers
    - Tire Technology
    - Consumer behavior in maintaining inflation pressure

Summary of NAS Recommendations

Recommendation #1

- Development of a standard measure of tire's effect on fuel economy deserves consideration
- Implication
  - Rolling resistance will typically decline by more than 20% over the service life of a tire, with the rate of change varying from one design to another
  - Current test methods only evaluate new tires
  - Research would be necessary to develop a test that estimates a tire's average lifetime rolling resistance

Recommendation #2

- Congress should authorize and make sufficient resources available to NHTSA to allow it to gather and report information on the influence of individual passenger tires on vehicle fuel consumption
  - The effort should cover a large portion of the passenger tires sold in the United States
  - It should be comprehensive with regard to popular sizes, models, and types, both imported and domestic
- Implication
  - RR for tens of thousands of replacement tire model-size combinations will have to be obtained
  - NHTSA would be responsible for disseminating rolling resistance data

Recommendation #3

- NHTSA should consult with the U.S. EPA on means of conveying the information and ensure that the information is made widely available in a timely manner and is easily understood by both buyers and sellers
  - The agency should seek the active participation of the entire tire industry
- Implication
  - The International Energy Agency and others have recognized the effectiveness of the Energy Star Rating Program
  - Similar programs will be necessary for tires

Recommendation #4

- The effectiveness of consumer information and methods used for communicating it should be reviewed/revised regularly
  - Congress should require periodic assessments of the initiative's utility to consumers
  - Assess the level of cooperation by industry, and the resultant contribution to national goals pertaining to energy consumption
- Implication
  - Suggests that Congress should require periodic assessments of the effectiveness of the program
  - Will require substantially more resources

Recommendation #5

- Motorist must be alerted to the fact that even small losses in inflation pressure can greatly reduce tire life, fuel economy, safety, and operating performance
  - A strong message urging vigilant maintenance of inflation is necessary
  - It must be a central part of information on the energy performance of tires to motorist
- Implication
  - Will require expanded consumer information and advisories on tire maintenance
  - Tire Inflation Systems for commercial vehicles may have to be considered

Overall VSR Concerns

- Rolling resistance testing is expensive, lengthy, and testing capacity is limited
- There are tens of thousands of replacement tire model-size combinations
- Without self-reporting from manufacturers, the resources required and the expense of a program would be very high
- The California Energy Commission's study of approximately 150 tire model-size combinations is still awaited
- Decision should wait until that is completed