



Future Truck Program Position Paper: 2008-1

Future Wheel and Wheel Systems User-Driven Needs and Expectations

Developed by the Technology & Maintenance Council's (TMC)
Future Tire & Wheel Task Force

ABSTRACT

TMC's Future Tire and Wheel Task Force has defined future performance requirements of tires and wheels according to fleet and end user needs and concerns. This includes all aspects of new tires, retread tires, tire repairs, new wheels, refurbished wheels, attaching hardware, and all associated maintenance issues. This TMC position paper defines future features and expectations for wheels and wheel systems in terms of product performance, maintainability, reliability, durability, and serviceability, environmental and educational issues.

INTRODUCTION

TMC's Future Tire and Wheel Task Force has defined future performance requirements of tires and wheels according to fleet and end user descriptions of their needs and concerns. This includes all aspects of new tires, retread tires, tire repairs, new wheels, refurbished wheels, attaching hardware, and all associated maintenance issues. Based on its work, TMC has developed a position paper to define future features and expectations for tires and wheels in terms of product performance, maintainability, reliability, durability, and serviceability, environmental and educational issues.

This paper concentrates on wheels. Other papers now or will address tires, tire repair and retread, and the combined tire/wheel/maintenance needs of light/medium and speciality vehicles.

TARGET GOALS FOR FUTURE WHEELS AND WHEEL SYSTEMS

Maintainability:

Wheels should be as maintenance free as possible. The first issue for tomorrow's wheels is the appearance/finish lasting for the life of a vehicle by using new developments in paint

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and coating technologies. Air retention of the wheel/tire assembly is a key issue that can take many directions. This could be affected by the use of flow-through/self-sealing valve caps or pressure equalizers for duals. Inflation pressure maintenance systems are also being developed and may require new means to pass air into a wheel/tire assembly. Sensors that alert users to air pressure loss and on-board pressure maintenance systems (CTIS), that maintain air pressure and alert drivers when a loss of air occurs need to be further developed.

In the future, improvements can be made in valve stems, valve stem grommets/seals, valve cores and caps, to make inflation, deflation and inspections more effortless and rapid in all applications and climate conditions. New designs in wheels may employ different types of alloy in metals or other materials.

Future wheels should have less runout and fewer balance issues and be lighter weight to meet customer needs. Tomorrow's wheels and fasteners should maintain torque once the wheels have been installed. No re-torque should be required. However, some system must be devised to verify that there is no torque loss.

Reliability:

Tomorrow's wheels should have better internal air pressure retention, by virtue of improved valve stems, cores and seal materials. Tomorrow's wheels should feature improvements in design that promote easier concentric seating of the tire beads and improved centering of hub-piloted systems.

Durability:

Depending on application, wheels and their fasteners should be engineered in such a way as to match the service/maintenance life of the vehicle on which they are mounted. These wheels should be resistant to corrosion and be resistant to flange wear. Wheel manufacturers

should look at alternative materials in making wheels that lead to improved impact resistance and greater durability.

Serviceability:

The appearance/finish of wheels of the future should last for up to 10 years without refurbishing. Wheels should clean up as easily as the rest of the vehicle with no specialized cleaning/polishing required, if the manufacturer's guidelines are followed. Future wheels should continue to have clear markings that coincide with tire markings to facilitate tire/wheel assembly and balance. Ideally, this marking should become unnecessary as wheels and tires are designed and constructed with greater uniformity. The interim wheels should have an improved balance weight retention system.

Wheels of differing width dimensions are sometimes used in the same fleet, but differentiation is difficult. There currently are stampings of wheel part numbers, manufacturing date, maximum allowable load and pressure, and wheel size in diameter and width. These stampings should be prominently displayed on the wheel in a location that can be easily seen when the tire is mounted on the wheel and the tire/wheel assembly is mounted on the vehicle. The information currently stamped on the wheel might be contained on a electronic chip embedded in the wheel that can be accessed wirelessly with a reader for size and age confirmation.

The wheel end mounting system must become more standardized in types of mounting systems, (hub pilot, stud pilot, cast spoke/demountable). Wheel offsets, bolt circles, hub bore diameters, number of studs, and the number and size of hand holes should be standard for each wheel system. Wheel systems should be interchangeable. All fasteners should have a standard thread direction, take an initial torque and retain that torque until the wheel is removed for service. A mounting system that utilizes a single fastener per as-

sembly is requested. Attaching hardware should last the life of the vehicle. Future wheel attaching systems may not require conventional fasteners.

Wheels must have improved handhole design to gain easier access to the inner dual valves for serviceability and be adaptable to future tire pressure delivery systems and run flat technology. Larger or additional handholes could be designed to manage cooling air flow over the brakes and/or improve the overall aerodynamics of air movement around the tire/wheel assembly.

Future wheels may be designed to use a larger bore valve stem for faster inflation, inflation maintenance and deflation of tire/wheel assemblies. Wheels must be more resistant to corrosion. They should use different materials/coatings to maintain a, "self cleaning bead seat area", for ease of tire seating. In addition to the use of new metal alloys or other materials, future wheels might be designed as a one-time use disposable unit to last only as long as the tire fitted to it. It could then be easily recycled for other needs, never seeing the scrap pile or final waste stream.

Design Issues:

Future wheel design must take into account the adoption of disc brakes in addition to the current drum type brakes. Since both brake systems can be in use in the same fleet there is a need for a common wheel that can fit both.

Environmental Issues:

Tomorrow's wheels should continue to be made of materials easily recyclable, especially to be reused to manufacture new wheels. With the advent of more durable surface coatings, less wheel reconditioning means less pollution in terms of finish removal and paint overspray issues. Improved wheel uniformity should eliminate the need for external balance weights; thus, eliminating the use of lead in maintenance procedures.

Education/Training:

Future wheel systems will require new and more efficient means of training personnel to handle the newest technologies. A comprehensive, objective and recognized education program must be readily available, easy to understand and able to be conducted in a short period of time. □