TIRE INFORMATION SERVICE BULLETIN

COMMERCIAL TIRE OPERATING TEMPERATURES

INTRODUCTION

The temperature at which a tire operates is important to achieving optimal tire performance. Tire temperature is affected by vehicle speed, load, inflation pressure and external factors. These external factors include, but are not limited to, ambient air temperature, road surface temperature, and heat generated by the vehicle's engine, exhaust system, brakes, and emissions control equipment.

Recent trends in vehicle aerodynamic designs and emissions equipment may further contribute to heat build-up in tires making tire maintenance even more important. The purpose of this Tire Information Service Bulletin is to explain the various tire heat contributing factors and the cumulative and irreversible impact they can have on tire performance. It is critical to closely monitor and manage tire heat-contributing factors that are within a fleet or vehicle operator's control. (See Actions to Take)

BACKGROUND

Historically, the external air temperature in the fender well surrounding the tires closely matched ambient air temperatures. Heat generated by the vehicle's engine, emissions equipment and exhaust was dissipated by airflow through the fender well. This airflow also actively cooled the tires while in-service. To improve fuel economy, OEM and aftermarket manufacturers have introduced aerodynamic body features on their vehicles such as low ground clearance air dams and side fairings. These aerodynamic features may have the effect of reducing airflow in the fender wells. This hinders the dissipation of heat and increases tire operating temperatures.

FINDINGS

These recent developments in truck technology have resulted in an increase in the number of tire claims related to heat damage. The tire industry has been evaluating tire performance on late model vehicles equipped with certain newer aerodynamic configurations and found both front fender well and tire operating temperatures to be significantly higher than ambient air temperatures.

Testing conducted by some USTMA members at equivalent tire operating conditions concluded that these higher than ambient air temperatures associated with certain newer aerodynamic configurations significantly decreases tire performance across multiple products and manufacturers.

These findings indicate that heat build-up in the front fender wells of certain newer aerodynamic configurations could lead to significant performance degradation. This degradation may in addition be impacted by more severe operating conditions that increase internal tire operating temperatures. The tire industry has consistently warned that operating tires over loaded, under inflated, or at high speeds could cause excessive heat to build up in tires. The tire industry believes that recent aerodynamic technology and these more severe operating conditions create a high heat environment that contributes to a reduction in the life span of tires on certain vehicles.

KEY TAKEAWAYS

The results of the tire industry's studies indicate that heat is building in the front fender wells of certain vehicles equipped with newer aerodynamic configurations due to the lack of cooling airflow.

High ambient air temperatures and heat contribution from vehicle sources may allow temperatures in the front fender wells to reach levels not previously observed in commercial vehicle applications. This external heating may be worsened by more severe operating conditions that further increase internal tire temperatures. The tire industry believes this high heat environment contributes to a reduction of the lifespan of tires on certain vehicles. Such excessive heat degrades all pneumatic tires, is cumulative, irreversible and may lead to premature removal from service and possible tire failure before the tread is worn.

The tire industry has consistently warned that operating tires over loaded, under inflated, or at high speeds could cause excessive heat to build up in tires. Factors contributing to tire heat are additive and due to the introduction of aerodynamic technologies, the list of factors is expanding.

ACTIONS TO TAKE

Operators may not be able to control certain vehicle design features that contribute to tire heat build-up, making it critical to closely monitor heat-contributing factors that an operator can control. USTMA members recommend the following practices to reduce the likelihood of excessive heat build-up in tires:

- Do not exceed the tire's maximum rated speed, which may be lower than posted speed limits. Internally, the tire generates heat based on the speed of tire rotation. No tire, regardless of its design or speed rating, has unlimited capacity for speed. Operating beyond the rated speed may lead to excessive heat build-up and premature tire failure. States continue to increase speed limits (many in excess of 70 mph) on certain highways and this trend may continue. While the higher speed limits are applicable to all motor vehicles including trucks and buses, tires on these vehicles may not have the speed capability to meet these new higher speed limits and should not be operated beyond the tire speed category. See Figure 1. Fleets should consider electronically limiting the max speed capability of their vehicles to align with the max speed capacity of the tire.

SPEED SYMBOL	SPEED CATEGORY*
F	50 mph (80 km/h)
G	55 mph (90 km/h)
J	62 mph (100 km/h)
K	68 mph (110 km/h)
L	75 mph (120 km/h)
M	81 mph (130 km/h)
N	87 mph (140 km/h)

* In laboratory testing that relates to highway speeds. Actual tire speed and performance capability depend on factors such as inflation pressure, load, tire condition, wear and driving conditions.

FIGURE 1: Speed Symbols

- Set and maintain proper cold tire inflation pressures as shown on the vehicle's placard or follow tire manufacturer recommendations. Under inflation creates over deflection, which causes excessive heat build-up that will degrade all pneumatic tires. This may lead to premature removal from service or possible tire failure.
- The pressure marked on the sidewall that corresponds to the maximum load of the tire is typically the maximum cold inflation pressure recommended by the tire manufacturer for that tire. Do not exceed the cold inflation pressure shown on the tire sidewall without first contacting the tire and rim/wheel

manufacturer. Over inflated tires are more likely to be cut, punctured or damaged by sudden impact from hitting an obstacle such as a pothole.

- Never "bleed" or reduce inflation pressure when tires are hot from driving, as it is normal for pressures to increase above recommended cold pressures. If a hot tire pressure reading is at or below recommended cold inflation pressure it may be dangerously under inflated. In this case, immediately determine the cause and/or have the tire checked by a tire service professional.
- Use an accurate tire pressure gauge to check tire inflation pressures at preventative maintenance intervals and during pre-trip vehicle inspections. Check inflation pressure when tires are cold, that is, when the vehicle has been parked for at least three hours or has been driven less than one mile at moderate speed. Inflation pressure checks should include all tires, including the spare tire, inside duals, and tires equipped with a Tire Pressure Monitoring System (TPMS).
- Do not exceed the tire's maximum load carrying capacity. Overloading creates over deflection, which causes excessive heat build-up that will degrade all pneumatic tires. This may lead to premature removal from service or possible tire failure.
- To avoid over loading tires, maintain the proper inflation pressure and never exceed the vehicle's load capacity, Gross Axle Weight Rating (GAWR) or the Gross Vehicle Weight Rating (GVWR) stated in the vehicle tire placard, certification label or the vehicle service manual. The vehicle load must also be distributed so that no individual axle, tire or dual assembly is over loaded.
- The maximum load for each tire is molded on the tire sidewall (along with the cold inflation pressure for that load). Never exceed the load or inflation pressure limits of the tire, rim, or wheel assembly.
- Consult the vehicle owner's manual or service manual for load recommendations and special instructions (such as the use of tag axles).
- Inspect tires regularly for conditions such as irregular tread wear, cracking, scrapes, bulges, cuts, snags, punctures, foreign objects or other damage resulting from use.
- Monitor tire inflation pressures and temperatures with your vehicle's TPMS system (if equipped). Wheel well temperatures can be increased by restricted airflow due to aerodynamic features, a vehicle's engine and exhaust systems and ambient temperatures. In certain instances, these increased wheel-well temperatures can be a greater influence than the other sources of increased heat. If alerted by the TPMS of high operating temperatures, the operator should confirm the tires' pressure and the vehicle's load and reduce operating speed. It is important to check inflation pressure with an accurate tire pressure gauge even on vehicles that are equipped with a TPMS.

⚠WARNING

Under inflation and/or over loading of a tire causes excessive heat build-up and internal structural damage. This may cause a tire failure, including tread/belt separation, even at a later date, which can lead to an accident and serious personal injury or death.

Over loading a vehicle can have other serious safety consequences such as suspension or wheel failure, increased braking distance or brake failure (particularly on steep grades), and adverse vehicle handling/stability.

Consult the vehicle tire placard, certification label and service manual for the recommended vehicle load limits and tire inflation pressures.

ADDITIONAL CONSIDERATIONS

The recommendations provided in this document are meant to address operating conditions that are within the fleet or vehicle operator's control. The heating effects from vehicle design features, such as aerodynamic packages and emissions equipment, may vary greatly from vehicle manufacturer to manufacturer due to factors such as: ground clearance, air ducting/venting, and the position of other heat-generating vehicle components.