

Temperature Impact on Tire Service Life

A tire's service life is a cumulative function of storage and service conditions that a tire is subjected to throughout its life (e.g., load, speed, inflation pressure, road hazard injury, environmental influences, etc.). Since service conditions and tire maintenance can vary widely, accurately predicting the service life of any specific tire is not possible.

The influence of higher temperatures on tire service life may be twofold:

1. Influence by peak temperatures usually maintained only for short periods of time. Such peak temperatures are typically reached in high speed application. The tire's ability to withstand such heat and/or to dissipate such heat is checked and assessed by the tire manufacturer and indicated by the tire's speed symbol as written on the tire's sidewall as part of its service description.

2. The influence of time/temperature exposure.

The longer a tire is exposed to higher temperatures, the more likely it will sustain detrimental changes in materials and properties. Further, the higher the temperatures, the more rapidly these changes will occur. Such changes may reduce the tire's robustness/resistance to fatigue, which may result in damage to the tire.

Continental recommends the following for tire storage conditions:

Avoid storing tires where they are subject to extreme temperatures.

Do store tires at temperatures not exceeding 35°C (95°F), preferable below 25°C (77°F). Tire operating temperatures may be higher. However, the longer a tire is exposed to higher temperatures, the shorter its useful service life. Continental recommends that all tires that were manufactured more than ten (10) years previous be removed from service. If the tire has been subjected to any significant time/temperature exposure, Continental recommends that the tire be removed from service accordingly earlier. If a customer is unsure if a tire should be removed from service or not, he/she should have it inspected by a trained tire specialist without delay.

As established by NHTSA (the National Highway Traffic Administration of the USA) and ASTM (Association for Standardization of Testing Methods), keeping a tire at 65°C under certain defined harsh conditions for 5 weeks may represent the aging a tire might experience in an extremely hot climate over 4 to 6 years.

By a rough estimation according to Arrhenius' law, the following equivalence table can be given:

2 weeks at 55°C represent 1 year of service,
1 week at 65°C represents 1 year of service,
½ week at 75°C represents 1 year of service in a hot climate.



This table may be used as a guide as to how much the service life should be reduced.

Another item to be considered is the influence of cold temperature extremes. Deeply cold temperatures (below approximately $-30^{\circ}\text{C}/-22^{\circ}\text{F}$ for summer/high performance tires and below approximately $-50^{\circ}\text{C}/-58^{\circ}\text{F}$ for winter/all season tires) might lead to brittleness. Therefore, tires in cold temperature extremes should be carefully warmed up before use.