

# The Importance of Proper Inflation Pressure

## FUNCTIONS OF A TIRE

Tires are critical components of off-the-road vehicles.

The tires are relied on to:

- 1] Support the load of the vehicle by retaining the inflation pressure.
- 2] Provide traction and braking.
- 3] Control the direction of travel.
- 4] Absorb road shocks to smooth the ride – On most OTR equipment, the tires are the only suspension for the equipment.
- 5] Overcome road hazards.

Each and all of these critical functions affect the productivity of your equipment and subsequently affect your bottom line.

Tire designers use sophisticated tools such as finite element analysis and laser engraving to design and manufacture today's OTR tires. A very critical design factor of all these tires whether radial or bias construction is the tire shape. Designers very carefully design the mold shape to produce the resultant inflated tire shape for maximum performance in the intended application. **Tire shape has a large influence on many tire performance factors such as:**

- 1] Footprint shape, which is a critical factor in tire wear, traction, and handling.
- 2] Ride comfort.
- 3] Vehicle stability which is very critical in equipment such as telescopic material handlers and wheel loaders.
- 4] Loaded tire shape; bulge location, and size must be planned for the desired load capacity, pneumatic cushioning and resistance to sidewall cutting and bruising from rocks.

The proper tire shape is critical to ensure the tire is able to best perform the functions of a tire. Proper tire shape ensures the maximum tire life and best performance characteristics.

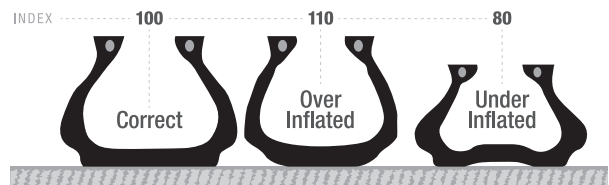


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## PROPER INFLATION=OPTIMAL TIRE SHAPE=BEST TIRE PERFORMANCE

Just as with people, tires perform best at their optimal or designed shape. Optimal tire shape is maintained by proper tire inflation pressure.

**!** The function of inflation pressure is to maintain the designed shape of the tire under load.



Pneumatic tires that are either under or over inflated will fail to perform to their maximum capability.

In the above illustration, correct inflation for the load applied maintains the designed tire shape. The tire can deflect as intended under load and achieve the best possible footprint shape and size for maximum traction, flotation and wear life. Correct inflation will result in the intended sidewall shape under load, which will maximize ride comfort and best resist sidewall cuts, bruises, and punctures from worksite rocks and other hazards. Correct inflation will generate minimal heat and minimize stresses on the tire casing leading to maximum tire first life and increasing the potential for retreadability of the casing.

Inflating a tire to even 110% of the needed inflation pressure for the applied load results in a distorted shape. The center of the footprint will carry more of the load while the shoulders will be relatively unloaded. This will cause heat buildup in the tread center and premature wear on the shoulders. Over inflation makes a tire much more susceptible to cuts and impact breaks. Over inflation also magnifies the stresses on the tire structure resulting in a reduction in original life and the potential for retreadability. Over inflation will also reduce traction and flotation and compromise handling.

Now let's look at the most common occurrence which is low inflation pressure. Under inflation is simple having less inflation pressure in a tire than required to properly carry the applied load in the subject application. Under inflation can also be called overloading. Because if the inflation is less than required by the load, conversely, the load is more than that supported by the inflation pressure.

## UNDER INFLATION – OVERLOADING

A tire that is under inflated is being applied at less than its optimal shape. Under inflation leads to overloading the shoulders and relative unloading the center. This will cause excessive heat buildup in tire shoulders as the rubber is usually thickest there. The tire center will scrub casing excessive center wear. As well as negatively effecting wear, the poorly shaped and unevenly established footprint of an underinflated tire will lead to poor traction, flotation and handling. The excess stress on the overloaded shoulders may lead to belt edge separation or casing fatigue. Under inflation will shorten tire life, compromise handling and can be a safety hazard.

A very important safety note on underinflated tires, especially steel/steel radials, is the possibility of creating a zipper tire:

**ZIPPER TIRES:** Tire cords work together in combination with tire beads and the correct inflation pressure to form a very strong yet flexible structure. When tire cords are repeatedly over flexed and reloaded through many cycles of running or sitting for long periods underinflated, the cords can become weakened or may even break. This could be a potential issue that is not visible from the outside, especially in an OTR tire due to the thick sidewalls. If a tire is run underinflated allowing repeated over deflection to weaken or break cords, the result can be an injury resembling an open zipper (thus the name 'zipper tire'). Our first instinct when we encounter an underinflated tire is to immediately add the needed additional inflation pressure. However, think twice, a tire should only be re-inflated after careful examination determines it is fit for continued service. BKT recommends tires found to be inflated 80% or less of the recommended inflation pressure should be dismantled and carefully examined by a tire expert for signs of cord degradation. If, after careful examination, the tire is to be returned to service, as always, put the tire and wheel in safety cage or, if the assembly is too large, use a clip on chuck with a standoff long enough to allow an individual along with a pressure monitoring gauge and control valve to stand away from the tire sidewall. SEE DIAGRAM 1

Tires, especially steel radial tires, that have been sitting flat or have been run under-inflated (20% or more) should be dismantled and carefully inspected before re-inflation. The steel cords may have been kinked or over-flexed, and therefore weakened to the extent that they will not contain the needed inflation pressure.



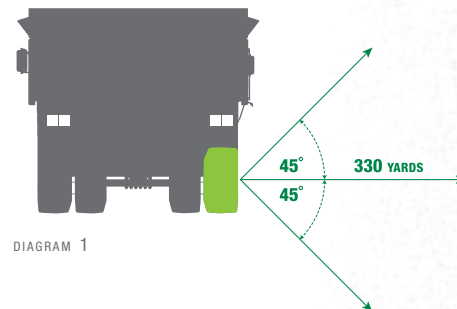
Zipper-like injury resulting from running tire under-inflated.

Under inflation will shorten tire life, compromise handling and can be a safety hazard.

If a tire is run underinflated allowing repeated over deflection to weaken or break cords or parked with little or no pressure in it, the result can be a zipper tire.

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### Stand Clear



We at BKT hope you have found this information helpful. The correct inflation pressure in an OTR tire will result in optimum tire performance and longest possible tire life. It will maximize your return on your tire investment and reduce the risk of tire related accidents.

**Stay tuned for our next technical paper on determining the correct inflation pressure for your equipment and application.**

*\*All statements herein are valid for air, nitrogen or other gases in pneumatic tires.*

