Inflation

Proper inflation of radial truck tires is the most important maintenance practice to ensure long tire life. Once proper tire inflation has been determined, it should be maintained at that level as consistently as possible. Loads carried may be increased/decreased for a given tire inflation when operating at reduced/increased speeds, but underinflation must never be allowed in over-the-road truck tires.

A tire requires proper air pressure to adequately carry the load placed on it. The "container volume," material properties and inflation pressure determine the load carrying capacity of the tire. **Figure 5.1** Your tires provide traction for braking, accelerating and turning and must carry out these tasks for many miles. Without proper inflation pressure, tires cannot carry out these tasks as they were designed to do.

But what is the proper inflation for your tires? A simple answer would be great, but not practical.

Loads determine inflation

All tire manufacturers offer load/inflation tables that can be used to determine the proper inflation pressure at various loads.

Load/inflation tables for Goodyear commercial tires are published on the Web site *www.goodyear.com/truck* and in the Engineering Data Book for Over-the-Road Truck Tires. This book, available at your Goodyear Commercial Truck Tire Center, and is updated periodically with the latest sizes and types of commercial truck tires.

Section "L" in this data book provides the information you'll need to determine the proper inflation for your tires based on load and service conditions. Most data contained in this book is taken from tables published by the Tire & Rim Association (T&RA). Its members, U.S.-based tire, rim and wheel manufacturers, set the technical standards for manufacturing those products in this country.

Using the tables is quite simple. First, determine the maximum load that your tire is likely to encounter. Then, for your tire size/ply rating, find the load in the table that is close to but slightly more than the maximum anticipated load. The inflation pressure at the top of this column is your minimum pressure for the load.

Duals vs. singles

Note that loads are shown for single and dual applications. When you run duals, the allowable load at any given inflation pressure will be less than with singles. That's to minimize overloading when one tire in a dual assembly is underinflated and to compensate for road crown.

Position is another consideration. Steer, drive and trailer tires may carry different loads, with steer tires normally handling the heaviest because they run as singles.

To optimize tire performance, you may require different inflation pressures in each axle position. That would be ideal, but impractical for many linehaul fleets.

Equal inflation pressure

To compromise, determine the proper inflation pressure for each tire on the vehicle and use the highest pressure. Remember that overinflation is preferred to underinflation. That makes the compromise acceptable.

Also consider operating speeds. Vehicles operated at less than highway speeds can carry greater loads, as shown in **Table 3**.

Using load/inflation tables can help you get the most from your current tires. It can also help you choose future tire sizes based on your vehicles' needs and their service conditions.

Always check inflation pressures when tires are cold. Never bleed air from hot tires to relieve normal pressure build-up. The normal increase in pressure due to service conditions will be 10 to 15 psi, and this is allowable in a radial truck tire.

It is particularly important to keep moisture from the inside of any tires and we strongly encourage proper selection of compressor equipment, air-line routing, and the use of air dryers to avoid moisture in high pressure air used for inflation.

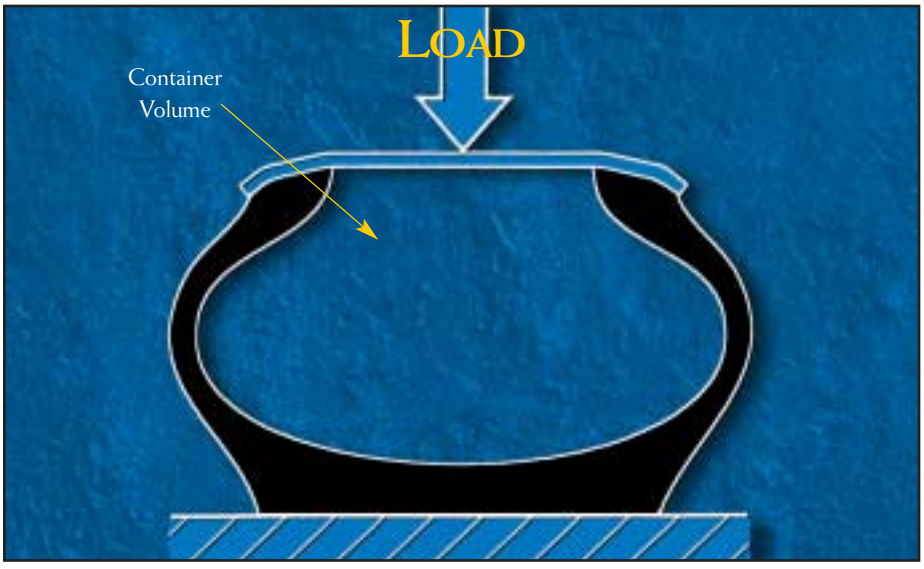

Figure 5.1

Table 3

TABLE 3
TRUCK-BUS TIRES

The service load and minimum (cold) inflation must comply with the following limitations:

SPEED RANGE (MPH)	INFLATION PRESSURE INCREASE RADIAL PLY TIRES				LOAD CHANGES WITH SPEED RADIAL PLY TIRES			
	CONVENTIONAL (STD. PROFILE)		WIDEBASE/METRIC (LOW PROFILE)		CONVENTIONAL		WIDE BASE/METRIC	
	65 MPH	75 MPH	65 MPH	75 MPH	65 MPH	75 MPH	65 MPH	75 MPH
71 thru 75	+ 5 PSI	None	+ 5 PSI	None	- 12%	None	- 12%	None
66 thru 70	+ 5 PSI	None	+ 5 PSI	None	- 4%	None	- 4%	None
51 thru 65	None	None	None	None	None	None	None	None
41 thru 50	None	None	None	None	+ 9%	+ 9%	+ 7%	+ 7%
31 thru 40	None	None	None	None	+ 16%	+ 16%	+ 9%	+ 9%
21 thru 30	+ 10 PSI	+ 10 PSI	+ 10 PSI	+ 10 PSI	+ 24%	+ 24%	+ 12%	+ 12%
11 thru 20	+ 15 PSI	+ 15 PSI	+ 15 PSI	+ 15 PSI	+ 32%	+ 32%	+ 17%	+ 17%
6 thru 10[1]	+ 30 PSI	+ 30 PSI	+ 20 PSI	+ 20 PSI	+ 60%	+ 60%	+ 25%	+ 25%
2.6 thru 5[1]	+ 30 PSI	+ 30 PSI	+ 20 PSI	+ 20 PSI	+ 85%	+ 85%	+ 45%	+ 45%
Creep thru 2.5[1] [2]	+ 30 PSI	+ 30 PSI	+ 20 PSI	+ 20 PSI	+ 115%	+ 115%	+ 55%	+ 55%
Creep	+ 40 PSI	+ 40 PSI	+ 30 PSI	+ 30 PSI	+ 140%	+ 140%	+ 75%	+ 75%
Stationary[1]	+ 40 PSI	+ 40 PSI	+ 30 PSI	+ 30 PSI	+ 185%	+ 185%	+ 105%	+ 105%

1) On conventional tires apply load increase to dual loads and inflations only, even if tire is in single application. **2)** Creep–motion for not over 200 feet in a 30 minute period.

Source: The Tire & Rim Association Yearbook

A tire's cold inflation pressure will change with altitude and temperature. The air pressure gauge reads the difference between the tire's contained air pressure and atmospheric pressure. Atmospheric pressure changes 0.48 psi for every 1000 feet change in altitude. Assuming constant temperature and internal tire volume, if a tire pressure gauge reads 100 psi at sea level, for every 1000 feet increase in altitude, the gauge will read 0.5 psi higher inflation pressure, see **Figure 5.2**.

Since this difference is small, the effect of altitude change on tire inflation, in general, is not considered to be significant.

Ambient temperature effects on a tire's cold inflation pressure, on the other hand, is significant. Using as an example a tire with an initial inflation pressure of 100 psi at 60 degree F ambient temperature, for each 10 degree F change in temperature, there is about a 2 psi change in the tire's inflation pressure, see **Figure 5.3**.

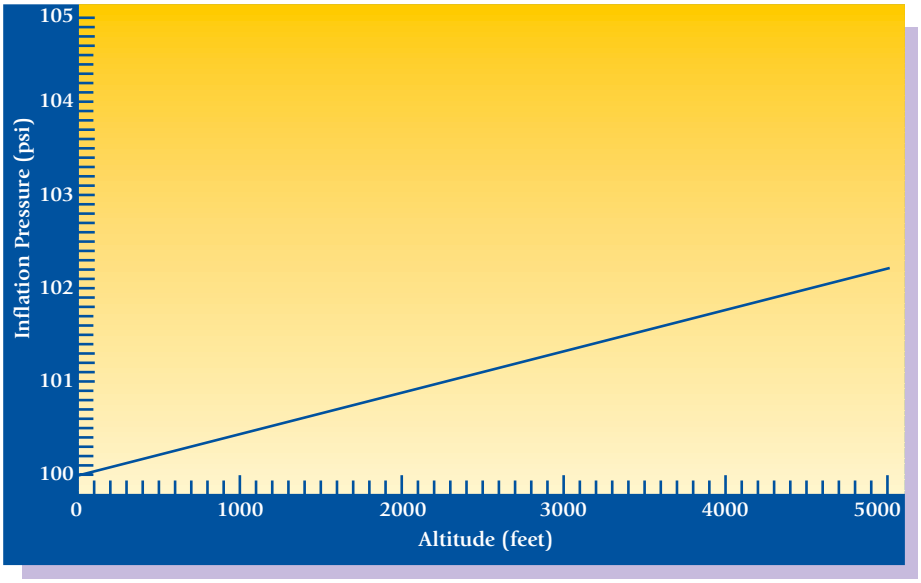

Figure 5.2

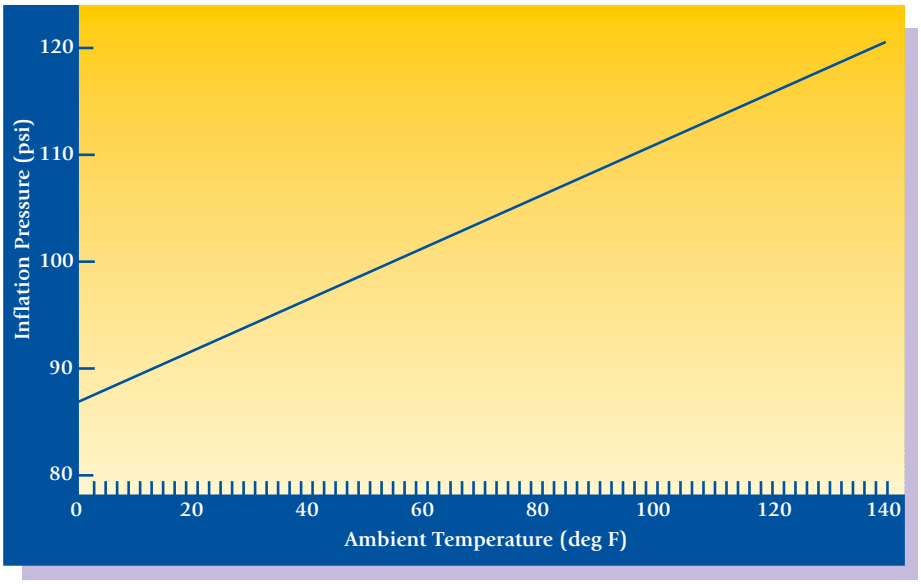

Figure 5.3

The inflation pressure reading at 0 degree F might happen when the truck is parked on a cold winter night. It will increase rapidly, though, once the truck begins to run and the tires warm up. At the other extreme of ambient temperatures, for example during the summer, it is common to find tire inflation pressures in the 115 to 120 psi range. We always caution operators not to bleed air pressure down on cold tires when they are at these higher ambient temperature conditions. Always inflate tires cold to the required pressure no matter whaat the ambient temperature is.

UNDERINFLATION

Underinflation can have detrimental effects on the performance of your tires and vehicles. Increased tire wear rate, irregular treadwear, reduced casing durability and lower fuel economy are some of the unnecessary costs incurred from tires not properly inflated.

Running on underinflated tires costs you in lost tread life and higher fuel consumption. Tests conducted by Goodyear have shown that just 15 percent underinflation of steer, drive and trailer tires results in about an 8 percent drop in expected tread mileage and a 2.5 percent decrease in miles per gallon, **Figure 5.4**.

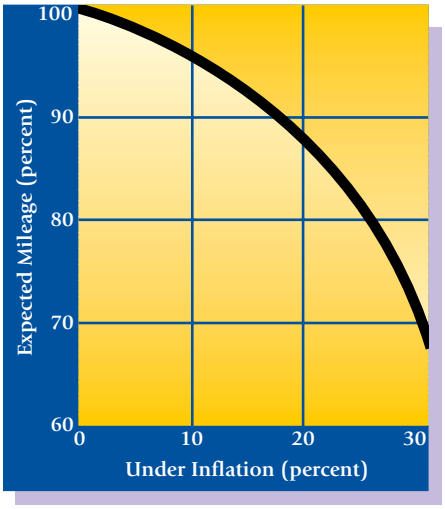

Figure 5.4

The damage doesn't end there. With the capabilities of today's truck tires, underinflation is also detrimental to your tires' potential for multiple retreads as well as sustained operation in today's service conditions.

Underinflation can cause casing damage and thus diminish the tire's ability as an "air container." This is of special concern since today's radial tires are capable of running much longer than the life of their original treads.

No spare aboard

Add to this fact that many fleets don't carry spare tires anymore. Although fleet inflation pressure maintenance has improved over the years, sometime over their working life, today's truck tires are still likely to run underinflated or flat. Continued running this way can seriously damage the casings.

Sidewall flexing increases noticeably when a tire's inflation drops 15 to 20 percent below recommended. Excessive flexing can result in cord fatigue and broken cords, and cords adjacent to these are subjected to greater tension when the tire is reinflated. The potential for a sidewall rupture then becomes very great.

Excessive heat does often cause the liner to wrinkle and discolor, and the upper sidewall to visibly distort and discolor.

UNDERINFLATION CAN CAUSE:

- Separations
- Circumferential Breaks
- Higher Risk of Road Hazard
- Loss of Fuel Economy
- Uneven/Irregular Wear
- Higher Risk of Road Hazard
- Higher Downtime Expense
- Loss of Casing Durability

Check psi weekly

Paying close attention to inflation pressures and to tires that have run underinflated has never been more important, considering the potential for sidewall ruptures, the value of retreadable casings, and the cost of tire related downtime.

The tire industry recommends checking inflation pressures once each week on all tires. This check should be made with a calibrated tire gauge or a gauge that is checked periodically with a gauge known to be accurate.

Another valuable tip is to use a sealing metal or nylon valve cap or a quality "air-through" type cap. Plastic caps do not provide a secondary seal to the outdoor environment, and no cap at all allows dirt, water and other foreign materials into the valve. Their presence invites air leakage.

Carefully inspect any tires that have been repaired or now have cuts, snags or other penetrations. Scrap any that show definite signs of underinflation. Mark a tire that looks suspicious in any way and set it aside for a thorough inspection by a trained tire technician.

When inflating or reinflating tires, always use a tire safety cage. This holds true for both tube-type and tubeless tires. The past few years have seen a decline in the use of tire cages, because of the growing popularity of tubeless tires. Some consider the cage necessary only when inflating the complex assemblies of a tube-type tire and rim. We strongly recommend using a tire cage regardless of the wheel or rim type.

The evolution of the radial tire has made it a long wearing, durable component of today's trucks. We should keep in mind that "radial" is not synonymous with "indestructible", and that proper inflation is the primary key to preserving radial tires' outstanding qualities.

Do's And Don'ts For Maintaining Proper Inflation Pressure

DO

- Do maintain proper minimum inflation for load carried per the Goodyear recommended table
- Do maintain mated dual tires at equal inflation
- Do use sealing-type valve caps
- Do check inflation at frequent intervals
- Do keep inflation air dry

DON'T

- Don't permit tires to operate underinflated
- Don't "bleed" air from warm tires to relieve pressure buildup
- Don't reduce tire pressure to obtain a softer ride
- Don't run with one tire of a dual assembly at low pressure or flat
- Don't inflate to cold pressures beyond rated rim capacity

Nitrogen Inflation

Over the years, nitrogen inflation has been proposed for various types of tires, including large earthmover tires down through small passenger tires. At the present time, Goodyear endorses nitrogen inflation for certain sizes of earthmover tires used in particular applications, and has issued detailed instructions for these tires. Anyone concerned with applying or maintaining earthmover tires should be aware of the Goodyear Service Department Bulletins and Off-the-Road Tire Training Manuals that contain details of nitrogen inflation recommendations for these large off-the-road tires.

The issue of nitrogen inflation for over-the-road truck tires is not quite so clear. Various performance improvements have been claimed, including better treadwear, casing durability, and reduced susceptibility to tire fires.

Although little actual controlled test data exists, a summary of Goodyear's experience with nitrogen inflation for truck tires is the basis for the following comments. Treadwear appears to be affected negligibly by the tire inflation medium. Specifically, there is little, if any, tread life change to be expected by using nitrogen inflation compared to normal air. So far as casing durability and retreadability are concerned, the primary criteria is to avoid moisture in whatever inflation medium is used. To this end, we strongly encourage proper selection of compressor equipment, air-line routing, the use of air dryers, and other good shop practices to avoid the introduction of moisture into high pressure air used for both initial tire inflation and make-up air. Again, we know of no significantly improved casing durability or retread durability performance to be expected from nitrogen inflation in over-the-road truck tires.

Reduced rim or wheel corrosion has also been cited as an advantage of nitrogen inflation. However, corrosion is primarily the result of excessive moisture introduced by air that has not been properly dried, rather than a direct result of air versus nitrogen inflation.

An additional concern is that past studies have shown that a very small percentage of non-nitrogen make-up inflation significantly contaminates the contained nitrogen atmosphere within a tire. In other words, if any benefits are to accrue from nitrogen inflation, it is essential that virtually all make-up inflation throughout the life of the tire/wheel assembly be diligently controlled to assure a near 100 percent nitrogen environment.

A final issue is that of insuring against tire fires and/or self-ignition of tires resulting from excessive heat. For truck tires, this concern has been greatly reduced in recent years, primarily because of the changes from bias to radial tires and from tube-type to tubeless tires. The tubeless radial tire is simply much less susceptible to a tire fire than a bias tube-type design. This is partly because of the simplicity of the tubeless design (i.e. no separate tube and flap to create heat from rubbing or internal friction when the assembly deflates or runs severely underinflated or overloaded), and partly because steel radial truck tires require higher temperatures for a fire to start than their fabric-reinforced bias-ply counterparts.

In summary, nitrogen inflation appears to have significant advantages for certain sizes and applications of large off-road tires, especially those operating in extremely high load or speed environments. However, nitrogen inflation appears to have quite small, perhaps insignificant, advantages for over-the-road truck tires.