The 3 Most Important Words in Heavy Duty Tire Care: Inflation – Inflation – Inflation

How can we keep inflation pressures “On Target”?

You would think that after a century of truck tire technology, everyone would understand inflation pressures.

What does the air do?
How much do you need?
How do you pick the right pressure?
How close do you have to be?

Unfortunately, there’s still a lot of confusion about trailer tire inflation pressures. And even though there are better ways to control pressures than ever, there are new questions and unfortunately, a lot of bogus information.

So, let’s try to clear up some of the confusion.

What does the air do?

Tire engineers will tell you that it is the air in a tire – not the tire itself – that supports the load. The tire is the container for that air. The air not only supports the load, but also becomes part of the suspension system, providing a certain amount of cushioning as you go over bumps.

How much air do you need?

Another good question. It turns out that the amount of air you need to support a load and cushion it depends on a combination of the volume of air your tire can hold, and the pressure of that air.

If you have a big tire that will hold a large volume, you can use a lower pressure. If your tire is small, you need a higher pressure. Remember those giant balloon tires they used to put on dune buggies, which had huge volumes and low pressures? And, you probably have one of those tiny “temporary spare” tires in your car, which requires a very high pressure (65 psi or so) to do its job.

Once you pick a tire size, you vary the load it can carry by varying the amount of pressure you put into it. If you need a lot of capacity, you will need a very strongly built tire. That’s what “ply ratings” and “load ranges” are all about.
When you put a load on a tire, it changes shape. The shape of the tire under the axle is different from the shape of the tire above the axle. That’s just simple physics: You’ve squashed the tire a bit. And that means as the tire rolls down the road, each part of it is getting squashed, then returning to its “un-squashed” shape. It’s flexing.

And flexing anything causes heat. Bend a paper clip back and forth until it breaks, and you will feel that the broken ends are warm, even hot. With a tire, too much flexing causes too much heat. Too little flexing, and it doesn’t provide enough protection from bumps.

Clearly, there’s a particular inflation pressure that’s ideal for each tire and each load. Too little pressure, and the tire may come apart. Too much, and it’s like driving on a cartoon caveman’s stone wheels.

**Picking your pressure**

Tire manufacturers publish minimum pressures for specific loads in what they call “Load & Inflation Tables.”

<table>
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There’s also a maximum load for any given tire, and a pressure for that. You see that in boldface letters in the Load & Inflation Table. It’s also stamped on the tire sidewall (more on that later).

Most fleets find their ideal inflation pressure through experience. This is the inflation pressure that is at least the minimum inflation pressure for the load, and that optimizes tread life, even wear, ride and fuel economy in your operation. When you set your tires to that pressure, your tires must be “cold.” Now, “cold” doesn’t literally mean cold. “Cold” means that the tire has been sitting at least 4 hours after coming off the highway.

**Different pressures for different temperatures?**

According to the Tire & Rim Association (TRA), if the load and inflation tables say “90 psi” for a particular load, you would set your tires to 90 psi, when they’re “cold,” as defined above. Or, as TRA says, set the pressure with the tires at the ambient atmospheric temperature. That’s the temperature you’ll most commonly encounter.

**Can’t we “Set it and forget it”?**

Life isn’t so simple. Unfortunately, it’s a fact of life that air never leaks into a tire. Air is always escaping from your tires, one way or another. It can leak through faulty valve stems and around rim flanges on wheels. And, if you pick up a nail, it can leak there.
You lose 1-4 pounds per month

Even if your valve stems and rim flange seals are perfect, you can still lose air. In fact, you can lose 1-4 pounds per month of inflation pressure because air molecules diffuse – or “leak” – through the tire itself. And, of course, different makes and models of tires vary in how much pressure they lose.

Why underinflation is bad

Over any extended period of time, no matter how good your tires are, if you don’t maintain your inflation, you are going to end up with underinflated tires. And that can be a very bad thing. Underinflated tires can run too hot, as we said, and may literally come apart. Not a good thing at 65 miles per hour. It can be dangerous to you, your cargo and to people nearby.

Plus, when a tire is underinflated, sidewalls can flex excessively, resulting in fatigue to the steel cords inside. This fatigue can result in the kind of dangerous and catastrophic failure called a “zipper” rupture.

Shorter tire life

And even if your tires don’t come apart, the excess heat will make your treads wear out faster (TMC says a 10% loss of inflation pressure results in 9–16% loss of tread life). Plus, that extra heat can also reduce casing retreadability, so if you retread your tires, you may not get those extra caps you’re counting on. And it’s not just the extra heat.

Underinflation results in a tread footprint that’s not optimized, and that can cause irregular tire wear that can lead to premature tire removal.

Wasted fuel

Excess heat from underinflated tires is also wasted heat. And where does that heat come from? You literally “make” it by burning diesel fuel. So, underinflation wastes fuel. Estimates vary because the amount of waste varies with different tires, but if all your trailer tires are just 4 or 5 psi underinflated, you could lose 1% on your overall fuel economy. Fuel is also wasted by drag and heat created when inflation varies from tire to tire on the same piece of equipment.

Fighting underinflation with overinflation?

You don’t want underinflation. It’s such a negative thing that most fleets deliberately put more air into their tires than they need to carry the load. Sometimes a lot more. For example, load and inflation tables for low-pro 22.5 trailer tires suggest that about 75 psi is adequate for a maximum legal load.

And yet, most fleets run 95 or 100, or even 110 psi in their trailer tires (120 on wide base singles). Why? Isn’t that running pressures that aren’t ideal? As we said, air never leaks into a tire, and most fleets would rather be safe than sorry.

If your “target” pressure is 75 psi, 100 psi would give you 8 to 12 months “safety factor,” with normal losses of 1-4 psi per month. Therefore, you could neglect your tires for six months or more, and barring punctures, you would probably still be running above the minimum pressure – without doing any tire pressure maintenance at all.
Safety First

Trouble is, you’d never know for sure until it was too late. And, as we’ve said, the consequences of underinflation can be catastrophic to your tires and public safety.

Besides, the law requires that every driver do both pre-trip and post-trip inspections, and “be satisfied” that the vehicle’s tires are in “safe operating condition.” With newly established CSA rules, that’s become more important than ever, because the fines and other consequences of neglecting tire inflation can be serious, affecting your bottom line, your safety record and the safety record of your drivers.

For many years, the problem has been underinflation, running tires at pressures less than required to support the load.

Finally, “Just right!”

Along came Automatic Tire Inflation Systems (ATIS), like the Meritor Tire Inflation System by Pressure Systems International (MTIS by PSI). It uses excess air from the air tank that is on every trailer, and automatically adds it to tires when their pressures get below the “target” pressure you have chosen.

The Meritor Tire Inflation System by PSI

This is great, because the system is automatic, and ready to do its job 24/7/365 whenever an operating tractor is attached to the trailer. If the inflation pressure falls below your “target” inflation pressure – which is set in the control box – the system feeds air into the tires. All tires have “on target” pressures.

That can mean great tire wear, great traction, great handling and great fuel economy. Every drawback to underinflation is canceled. In fact, the system is so good it can supply enough air to keep a tire inflated, even with a small puncture.

Each tire is individually filled and protected. If any tire is severely damaged, MTIS by PSI isolates that tire, preventing it from causing the other tires to go flat. A pressure protection valve on the air tank protects the air needed for braking – at all times.
The solution that pays for itself

MTIS by PSI equipment is simple, reliable, effective, inexpensive and safe. The return on investment can be fast. (For an ROI calculator, visit: http://psi-atis.com/ROI.htm). Just avoid one emergency road service call, and you can easily pay for an entire system. And extra tread wear, superior fuel economy and extended retreadability are additional benefits.

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Average Annual Cost Savings per Trailer
With the Meritor Tire Inflation System (MTIS™)

What possible downside could there be?

We said there’s an inflation pressure for every tire that is ideal. And so far, we’ve talked about what happens if you operate the tire below that pressure. What if you go above it?

We’ve already seen that a lot of fleets deliberately inflate their tires above the pressure specified in load and inflation tables. They’re trying to avoid the very bad downside of underinflation. So how high can you inflate your tires? What bad things could happen?

Understanding sidewalls

Of course, for every load, there’s a corresponding minimum inflation pressure. And they mold this into the sidewalls of your tires. The thing to remember is that the numbers on the sidewalls of your tires are actually **minimum inflation pressures for the maximum tire load**.

Pressures can go higher. In fact, they do every time you drive the truck. The heat generated by running down the road on even a 70-degree day probably raises the pressure of the air inside your tires by 10 to 15 psi. And on a hot day, with a heavy load at interstate speeds, it could easily be more than that. Let’s say that again: **Running at highway speeds adds at least 10 to 15 to 20 psi or more to your tire pressures – temporarily.**

Tires can take it!

Tire manufacturers know this. It doesn’t bother them. In fact, they design tires to compensate for it. And they know that once you stop at the end of the shift and park the truck for a few hours, those tire pressures are going to come back down as your tires cool down to “ambient” temperatures.
What really is “Overinflation”?  

There’s no reason to go above the pressure displayed on your tire sidewalls. The tire’s not legally rated for a higher load, so you wouldn’t increase the pressure for that. So, you probably would say that any pressure higher than what’s displayed on the tire sidewall is “overinflation.”

Are there bad consequences of overinflation? As we just said, you may very well go over the pressure stamped on your sidewalls for hours and hours when you are operating the vehicle. It’s normal, and expected.

Can automatic inflation cause overinflation?  

Let’s say you set the inflation pressure on your MTIS by PSI unit to 110 psi, the typical top pressure stamped on trailer tires. And, let’s say it’s 70 degrees F where you normally operate the truck. But today, you need to carry a load someplace where the temperature is 50 degrees cooler than where you started. That would be 20 degrees F. And, you’re going to stay there overnight before coming back.

Tire pressures change by about 2 psi for every 10 degrees of temperature change. So, when you get to your destination – and after you’ve been parked for about 4 hours – your tires are probably down to about 100 psi (50 degree temperature drop = 10 psi pressure drop).

Next morning, however, your MTIS by PSI system reacts to the fact that you are below your 110 psi “target” pressure, and adds air to your tires to bring them up to 110 psi. Without it, your tires would actually be 10 psi too low for your new location.

So, while you’re in the colder climate, MTIS by PSI will automatically keep your tires at your “target” inflation pressure. You also will experience improvement in both fuel economy and tire life.

Eventually, you drive back to the 70-degree environment and park the vehicle. The warmer temperature will add about 10 psi to your tires, but you’ll still be well within the extra margin the tire manufacturer allows.

If you keep driving back and forth between the warm location and the cold location, the situation isn’t going to change, as long as the temperatures both places stay about the same. The PSI system will not add any pressure to your tires unless they get below your “target” of 110 psi.

Is this a problem? What’s the solution?  

The first question to ask is: Is this really a problem? How often does something like this happen? Remember that you must go from the warm environment to the cold environment, stay there long enough for the tires to cool down and for the PSI system to activate and add pressure to the tires, and then come back to the warm environment.

Now, let’s say this happens all the time, or that the temperature extremes are even worse. Well, there are five ways to cope with the situation:
#1: Perfect Solution

If you do regular air pressure maintenance, you’ll reset your warm location pressures to the proper level. Problem solved.

#2: Clever Solution

You could select a different “target” pressure in your control box. If you set it to 100 psi instead of 110, you’ll only be down to 90 at the cold location, still well within the “normal” range – and the PSI system will add air to get you back to 100. When you return to the warmer environment, you’ll only be at 110, at the top of the “normal” range.

#3: Risky Solution

“Bleed” the extra pressure out in the warmer location. Bear in mind that you absolutely don’t want to “bleed” pressure from a “hot” tire. That is, you don’t want this bleeding taking place while you’re running down the road at 60 mph. And tire engineers are quite clear about it: None of them recommend bleeding pressure from a hot tire – ever! Most recommend leaving the vehicle parked at least 3 to 4 hours.

#4: Dubious Solution

Some ATIS makers propose an automatic system to do the bleeding. An interesting idea, but consider the implications: It may require extra electronics, pressure sensors, electro-mechanical devices to open valves, temperature sensors to make sure you’re not bleeding tires that are too hot – in short, many more moving parts and stationary seals. That means more complexity, more cost, more things to go wrong.

And what if something does go wrong? If Murphy’s Law is operating, your driver could – after a rest period – find one or more trailer tires completely flat. If your driver discovers this before taking off, it could take quite a while to re-inflate the tires, if that’s even possible. But what if your driver simply drives away? Every single one of your trailer tires could be ruined. What will that cost?

#5: The Simple PSI Pressure Relief Valve Solution

PSI recognizes that some fleets want really tight control over their inflation pressures. So, PSI has come up with a simple, reliable, safe, effective and inexpensive way to reduce tire pressures. It’s manual, meaning the driver, mechanic or tire person (depending on the situation) reduces the pressure by hand, while the trailer is parked.

The new device, called “The PRV (Pressure Relief Valve),” is a user-friendly, simply designed solution, consisting of a valve stem that can be retrofitted to any wheel and used with the standard PSI System or the PSI System with ThermALERT™. Simply slide the collar toward the wheel and hold it for 10-15 seconds. That reduces tire pressure by about 15 psi.

Release the collar and air flow stops. That’s obvious, because you can hear the air stop flowing. On a trailer equipped with wide base singles, all four tires can be reduced in pressure by 15 psi in about 90 seconds.
If you let out a little too much, it’s no problem, because the PSI light will come on and MTIS by PSI will automatically top off the tires as soon as the engine starts again. The PSI warning light will stay on until it is the proper time to move the vehicle. Simple, reliable, effective, safe and inexpensive.

MTIS by PSI: Keeping pressures “On Target” since 1993

PSI calls this new device “The PRV,” because it reduces pressure simply, safely and effectively. Most fleets won’t need it at all, but if you do, it’s available on new MTIS by PSI systems, can be ordered on new equipment from trailer manufacturers, or can easily be retrofitted to your existing system.

“Reliable, Inexpensive, Simple, Safe and Effective.”

There’s just too much risk of tire damage, or worse, public safety, in some of those other “solutions.” To be reliable, inexpensive, simple, safe and effective is PSI’s design objective.

Ask your favorite OEM, dealer or distributor about The PSI PRV, and stop worrying about overinflation – or underinflation – no matter where you go.

Find out more at www.psi-atis.com or just call 1-800-375-6464.

Available From PSI
The World Leader In Automatic Tire Inflation
Since 1993

NOTES:

1 Tread Wear: based on 10% extended life of 8 tires traveling 90,000 miles per year and a tire cost of $250.

2 Maintenance: based on 25 minutes per month spent checking and filling tires by a tire professional at $25 per hour.

3 Fuel: based on 1.25% annual savings, assuming 90,000 miles per year at 6 mpg and $3.00 per gallon.

4 Tire Downtime/Replacement: based on one service call and new tire cost.