

MAINTENANCE

The Magic Number

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How do turtles mate? Why are women's shirts buttoned on the left while men's button on the right? How did they build the pyramids? How much air should I put in my tires?

Unlike the pyramids, tire inflation needn't be one of life's little mysteries.

A glance at any tire maker's load and inflation tables has the answer, but many fleets inflate their drive and trailer tires arbitrarily to 95 or 100 psi – thus "overinflating" them and possibly sacrificing tire life.



Correct inflation pressure is dictated by weight, temperature and road speed – and the load and inflation tables.

I'll let you in on a little secret: You only need between 75 and 80 psi in any drive or trailer tire when loaded to the maximum U.S. Interstate weight limit of 34,000 pounds per tandem axle group. Published load and inflation tables from Goodyear and Michelin indicate 75 psi (80 psi by Bridgestone's table) is the minimum pressure required to support a tire load of 4,550 pounds. In a fully loaded 34,000-pound tandem, each tire in a dual assembly carries 4,250 pounds. That's cold inflation pressure, by the way, the standard inflation pressure denominator.

Many fleets want to err on the side of caution by running 95 to 100 psi in single tires in dual assemblies? From a safety and compliance point of view, there's nothing wrong with that.

"Operationally, it makes some sense to set tire pressures above the minimum to provide a margin of safety against running underinflated," says Guy Walenga, Bridgestone's director of engineering, commercial products and technologies. "Air leaks out of tires. It doesn't leak in. All tires lose pressure over time, some faster than others for various reasons."

Because drivers can't be relied upon to check tires regularly, a little spare air isn't going to hurt the cause.

Another oft-cited reason for running 100 psi in a drive or trailer tire is a potential reduction in rolling resistance.

"Yeah, there's some small improvement there," Walenga says. "Whether you'd be able to separate it from the rest of the noise in a fuel economy test, I'm not sure."

Herman Miller never saw much of a difference. He's the president of HJM Fleet Maintenance, and one of a rare breed who runs his tires close to the L&I table minimums – 110 psi in steer tires, 75 psi in drive tires and 80 psi in trailer tires.

"I believe that there may be some small increase in fuel economy, but I never could quantify it," Miller says. "There are far more compelling reasons to run lower pressures than higher if you have a solid tire maintenance program."

Miller's fleet ran light loads, mostly general merchandise for retail chains. He seldom goes over 70,000 pounds GVW. But that's not an excuse, that's the reasoning.

“We experience much less tire wear and casing damage than I hear other fleets complaining about,” he says.

The key, Miller says, is the ability of the slightly softer tire to flex the way it was designed to.

“We had almost no impact damage in all those years, and we saw none of the irregular wear that a lot of fleets complain about,” Miller says. “Those problems come from tires that are too hard to function the way they are designed to function – that is, having enough give in the casing to absorb impacts like potholes and road debris, and having the optimum footprint or contact patch.”

Minimum, maximum, optimum

Tire inflation pressures are not arbitrary. Each tire maker establishes minimum pressures based on tire loading, and the construction of the tire establishes the maximum allowable pressure.

The L&I tables indicate the minimum, and the maximum is stamped on the sidewall. It’s worth noting, too, that wheel manufacturers establish maximum inflation pressures, stamped into the wheel, of usually 130 to 150 psi.

What’s lacking is discussion about optimum pressure.

Donn Kramer, director of product marketing innovation at Goodyear Commercial Tire Systems, says tire loads determine inflation pressure.

“The specific pressure for a given load is available from tire manufacturer’s load and inflation tables,” Kramer says. “Fleets also can use tables provided by the Tire & Rim Association, whose members set technical standards for manufacturing tires and wheels.”

Walenga says essentially the same thing. “The idea is to keep your inflation pressures in line with your tire loads, Always inflate the tires to carry the maximum load, even if you load light some of the time.”

For Miller, at around 70,000 pounds GVW, his tire loads are light for even 75 or 80 psi. And he’s well within the margins for a full 80,000 pounds GVW.

Miller argues that inflating to the recommended L&I table pressures takes the tire back to where it was engineered to run.



Dual tires must be within 5 psi to maintain the same load on each tire, and to keep the circumference of the tires in a dual assembly the same.

“Inflating the tire to more than the recommended pressure for the load changes the shape of the tread, it stiffens the casing, and sets it up several wear and damage scenarios the tire wasn’t designed for,” he stresses. “I can only go by my experience, but I’ve had absolutely no problems in running at 75 or 80 psi in drive and trailer positions, where as I can point to excessive wear and damage from running 100 psi.”

Miller’s experience is backed up by tire experts. Al Cohn of Pressure Systems International (which makes the Meritor Tire Inflation System by PSI), explains that it’s all about the footprint of the tire.

“When you over-inflate, the footprint changes and it gets a little smaller,” he says. “But the biggest impact is – and this is what people don’t normally talk about – the loaded vs. unloaded

You may spec that higher tire pressure based on the loaded worst-case scenario, but in reality, in many cases, that trailer is empty, or at least a lot lighter than fully loaded. “So when you’re empty...the tire is going to develop all kinds of issues like uneven wear because you’re bouncing up and down the highway.”

Several things happen to a tire that’s over-inflated for its load.

“The tread tends to crown, leaving the shoulders of the tire scrubbing along the road as it tries to keep pace with the larger circumference of the center of the tread,” explains Walenga.

Like Cohn, he says it’s the worst when running empty. “The tires just bounce along the road, scrubbing a little more rubber off the tread every time they hit the ground,” he says. It’s a cumulative effect, and it can be severe in fleets like fuel haulers that run empty half the time.

Safety margin

The standard arguments for running 95 to 100 psi at drive and trailer positions is to build a margin against “underinflation” for tires that aren’t checked regularly, and for improved fuel economy due to the lower rolling resistance of the stiffer tire.

Both are reasonable arguments, but they may not hold up well to scrutiny. The potential fuel savings, if any, would be small and difficult to quantify amidst all the other variables in any fuel economy test.

That leaves the safety margin. Few would argue that tire pressures – especially on trailer tires – are notoriously under-maintained. And we’ve all heard the warnings about what running underinflated tires does to fuel economy. But when we’re talking 10% underinflation having a 1% to 2% impact on fuel economy, we’re really saying all the tires on the vehicle (except steer tires) would have to be in the 65 psi range.

This could be made more complicated by lack of consistency in law enforcement over exactly what constitutes underinflated. Because of the Federal Motor Carrier Safety Administration’s new CSA enforcement program, the Commercial Vehicle Safety Alliance is currently exploring how to define underinflation for enforcement purposes. To learn more, go to www.truckinginfo.com/underinflated.

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