



# *The Butterfly Effect on Tire Maintenance*

*A minute variation in tire size or pressure could cost you thousands*

*The effects of small discrepancies in tire inflation and unmatched dual tires are well documented, however, when analyzing the impacts of these two often correlated failures, the compounded results reveal a scary reality in fortunes of lost revenue.*

**A Key** to staying profitable in any business is reducing costs but, to survive in the trucking industry, how well you manage the cost of tires and fuel on a daily basis will make or break you. Most know that tire pressure affects fuel economy, however, what is often overlooked are the synergistic effects of dual tires mismatched by fractions of an inch, tire pressures off by just a few PSI and the resulting inflation of your operating costs.

### **3 Rules of Maximizing Tire Life and Fuel Economy**

1. Use only high quality air gauges to ensure accuracy and consistency
2. Duals must be matched in terms of diameter, not just tread depth
3. Standardize practices and equipment across all company locations for uniformity and accurate equipment

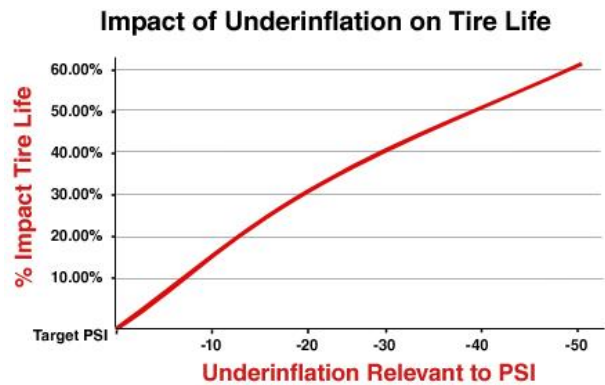
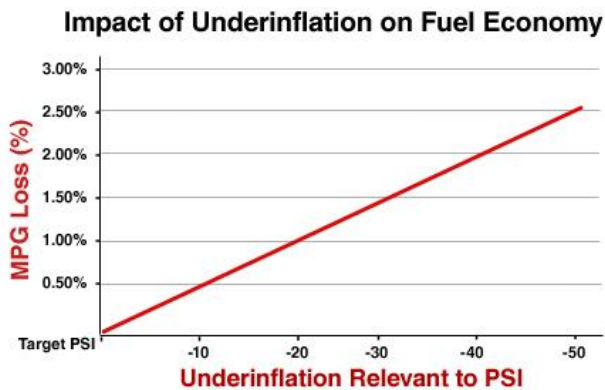
The advent of Tire Pressure Monitoring Systems (TPMS) and Tire Inflation Systems as well as low rolling resistance tires have helped in these areas, but unless your shop is following very important preventative maintenance procedures with accurate equipment, these new technologies are being effectively sabotaged.

### **INDUSTRY STATISTICS**

- 25-50% of tires are underinflated by 8 PSI or more- US GAO
- Running tires at 20% underinflated will reduce tire life by up to 50%- Goodyear and Michelin
- The average deterioration in fuel economy due to underinflated tires is 3.3%, which results in over \$2400 in extra diesel costs per power unit every 125K miles- NHTSA
- 600 fatalities occur annually due to underinflated tires- The Rubber Manufacturers Association

# A Two Headed Monster

It is well known that the two highest operating expenses for any fleet are fuel and tire costs. When you factor in the interrelated nature of tire inflation, fuel economy, and tire life, the compounded nature of these variables and their ability to sharply increase overall costs become quite clear. Looking at the graphs below, it is evident that an underinflated tire will not only impact fuel economy but also hurt the tire life, leading to a shorter service interval. Many fleets have already realized this, and as such have made changes such as spec'ing TPMS, Tire Inflation Systems, or low rolling resistance tires. Those who have taken it a step further have also implemented proactive tire maintenance programs to ensure their new technologies are being properly utilized. This exercise, however, relies on precision, and due to the variability in tire gauge accuracy, these programs can be doomed from the start.



## Inaccurate Pressure Gauges



A major reason even the most well intentioned tire programs fail to achieve results is due to inaccuracy of pressure gauges as a whole. Tires are engineered with a certain pressure range in mind that creates the optimal rolling resistance for the advertised savings in fuel costs. Verifying and maintaining proper inflation is not only a matter of habit and attention to detail, but requires precision equipment.

When comparing two brand new tire gauges from the same manufacturer, accuracy often differs up to 3% right out of the box. This only compounds the problem. A gauge with +/- 3% accuracy will shift your reading by as much as 3.6 PSI per tire at 120 PSI target inflation. In this example, two tires on the same axle could read 120 PSI on the gauge, while in fact, ending up 7.2 PSI off. Considering the aforementioned graphs and figures, it becomes clear that trusting inaccurate gauges can rob your bottom line at the rate of hundreds of dollars per vehicle.

**MYTH: An inaccurate gauge reading will be consistent among all tires**

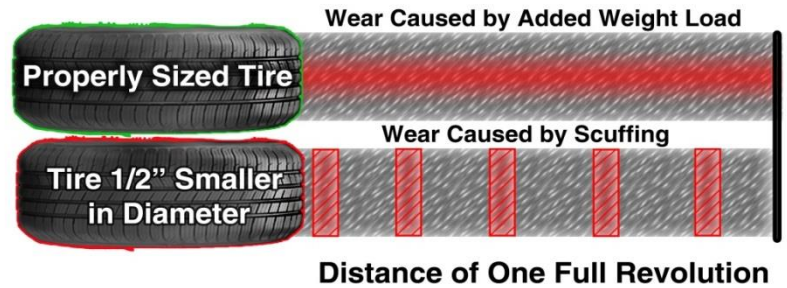
Based on the known results for inaccurate tire wear, using inconsistent and poor gauges can be very costly. So, while automatic tire inflation and tire pressure monitoring systems can assist in tracking problems on vehicles in service, proper inflation before the vehicle leaves the shop as well as highly accurate gauges used during routine tire pressure testing as preventative maintenance measures are required to maximize your investment.

# The Physics of Dual Tires

In addition to inflation pressures, dual tires are also plagued by a whole host of issues that arise from the nature of two tires mounted to a conjoined wheel assembly. These issues require a good deal of physics to comprehend, but considering a theoretical model of two different sized tires forced to rotate at the same exact ratio helps make the relationship clear.

## Minute Size Discrepancies

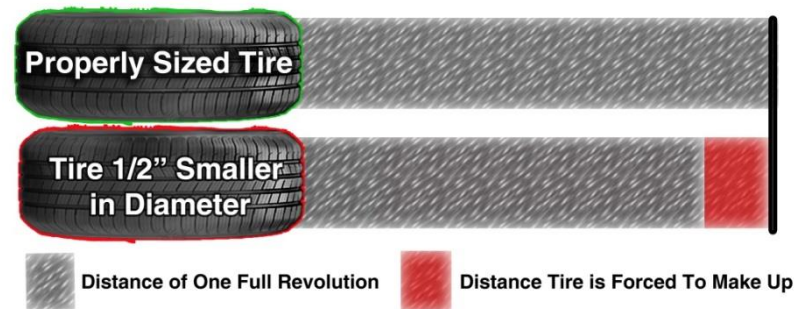
Even a size differential as small as 1/2 in. in diameter between a mated pair can shift a significant amount of extra weight to the larger tire. This will increase both tread wear and heat on the larger tire, directly reducing its lifespan.



While it may appear as though the larger

tire is taking the brunt of the abuse here, consider that the tires must travel the same distance since they are bolted together. Therefore, the smaller tire is dragged over the ground in minute intervals per every revolution as its circumference is less than the larger tire.

This effect is compounded over distance, as just a 1/2 in. variance results in the smaller tire being dragged 5.2 ft. per mile. This additional wear not only reduces the lifespan of the smaller tire, but also increases rolling resistance that serves to reduce fuel economy.



For both of the tires in this scenario, the chance of a catastrophic failure is greatly increased, leading to expensive road calls and permanent damage to the tire casing preventing future retreads.

## Tire Mating Techniques

Fleets often make the mistake of using either inflation pressure or tread depth as an indicator of a proper match. At first glance this may seem adequate, however, this introduces the paradox of tire maintenance. In fact, these two variables are independent of the diameter as a whole and if used alone will yield undesirable tread wear and fuel economy results.

A common misconception is two brand new tires of the same specification will be identical. In the world of manufacturing, variance is common place. Thus, two identically spec'd tires purchased and installed at the same time may vary in diameter. Additionally, tires in use are often subjected to irregular wear, and must be measured regularly.

By not inspecting tires carefully, fuel economy and tread life can be decreased from the start of their lifecycle. Considering an average cost of \$300 per tire and the aforementioned 5-20% tread life reduction, this yields a wasted \$15-\$60 per tire in a mismatched dual setting.

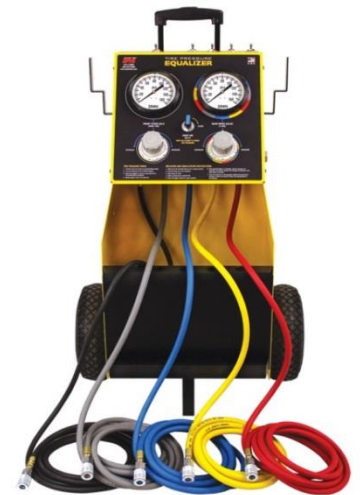
## Proper Tire Maintenance

In order to combat these two problematic areas of fleet tire maintenance, one must first look at the protocols for inspections, PMs, and inspection intervals. If the protocols are already in place, you must ensure that precise equipment is standardized to ensure maintenance procedures will yield repeatable results. Choosing the wrong system could compound your problem. Many maintenance managers are not aware that technicians often utilize personal gauges, which can be of poor tolerance, to check tire inflation. This decision can cost your operation hundreds of thousands of dollars per year in wasted fuel and tire wear.

## Correcting the Tire Inflation Problem

The best method to addressing this issue is to utilize a precise pressure inflation/equalization system that runs all tires and air through the same manifold and gauges of the highest available accuracy. This single point of reference will reduce tolerance stacking and improve the aforementioned fuel mileage and tire wear. Additionally, systems fitting these parameters of optimized plumbing offer faster inflation times and more user friendly than traditional methods.

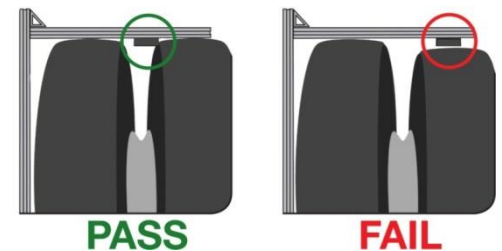
The IPA® [Mobile Tire Equalizer \(#9060\)](#) inflation system features two highly visible and accurate gauges with two high flow regulators. It provides fleets a way to inflate, equalize, or deflate up to five mounted tires at once to two different PSI settings simultaneously. This system is built with the most accurate gauges available, which will avoid the downfalls of improperly inflated tires that rob precious fuel economy and tread life.



## Correcting the Mismatched Duals Problem

Careful attention must be devoted to matching dual tires. Relying on the assumption that brand new tires are identical is simply erroneous. In addition to initial mounting, efforts should be undertaken to ensure tires are within tolerance at scheduled preventative maintenance intervals. A method commonly used is a tire square; however, these are not precise and involve a good deal of guessing, which is highly counterproductive to the goal of accuracy and repeatability.

IPA® has developed a highly consistent and accurate method of mating dual tires. The [Tire Comparator™ Type I \(9066\)](#) is a true caliper designed to measure both inner and outer dual tires accurately to ensure the diameters are within tolerance. For quick checks, the [Tire Comparator™ Type II \(9067\)](#) offers a sliding “go/no-go” gauge to ensure tires are within ½ in. relative to diameter.



As part of an overall tire program, these products will instantly help you receive the benefits specified as part of your tire related cost savings initiative. For more information on these products and others, please contact IPA® or your preferred tool/equipment dealer today.