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Discussion on Tyre Pressure – The 4psi Rule

The following excerpts are all taken from discussions on tyre pressures and the 4psi rule on the 4WD Action Forum. If you are looking for info on the 4psi rule or how to set your tyre pressures, then read on!

TYRE PRESSURES

Use the tyre placard pressures on your vehicle as a start point for normal road driving pressures. To begin, **set your pressures at the placard recommendations** one morning before heading off! (Maybe just on the way to work, does it take 30 plus minutes?)

Drive for about 1 hour – 30 mins minimum, but try not to go too much over 1 hour. Check the tyre pressures, if they have gone up by LESS than 4psi, your starting pressure was TOO HIGH, drop 2 psi now, and remember to use a 2psi lower start pressure tomorrow. If the tyre pressures are still not going up by 4psi after the next hour of driving, you still shouldn't drop any more unless you change road surfaces etc, otherwise you could end up damaging tyres. If they still don't go up, you need to start about 4psi lower tomorrow, and then see what happens.

If your tyre pressures go up by MORE THAN 4psi, your starting pressure was TOO LOW! Add more air NOW. To work out how much to add, subtract the pressure they should have ended up at from the end pressure you've just measured. Ie, they started at 20 psi & so should end up at 24 psi if all is correct, but they are now 29psi, therefore 29 minus 24 leaves 5. So add at least ½ of that 5 psi now; and use original start pressure plus your final add amount as tomorrows start point, ie. original start = 20 psi plus the 2.5 psi added today, start tomorrow on 22.5 psi.

You need to do that for every type of driving and road surface you drive on. It will take some time, but the end result is that you will learn very quickly to work out what pressure you should be running now, and what you should drop it to when you change road surface/driving needs, ie. 4wd rock crawling versus 4wd high speed good condition dirt with odd sandy patches!

Quote:

Originally Posted by Peter @ Aawen4x4

I use that 4psi rule everywhere, and for everything!! It works very well in ALL circumstances and across all variations that you can think of and a whole heap of others you never dreamed of! Use the tyre placard as a start point, drive for an hour, stop, and check the pressure. If it's gone up by MORE than 4psi, your start pressure was too LOW, add pressure now! If it has gone up by LESS than 4psi, then your start pressure was too HIGH and you need to drop 2psi NOW! Those new pressures should become your start points for the next cold start!

And when you are off-roading, then use it the same way. Start with the guidelines that come from places like the Cooper Tyre Book, the Mickey Thompson guide to tyre pressure, even the Prado4x4 guides above. Apply the 4psi rule, and adjust your pressures as you go. You will take only a short while to work out what pressure is a good start for you, and by using the 4psi rule you can adjust the pressures to what is the optimum for YOU and your driving style, load, vehicle, conditions, temp, etc. AND remember that when you drop your tyre pressure by say 20%, you should also drop your top speed by 20%!! Tyre pressures lower, speed lower!

BTW, Cooper tyres tend to run a lower pressures than most people generally think, probably because the extra layer of belting in the carcass reduces the flex in the sidewall a little and reduces the induced temp increase as you drive. Enjoy your driving, and don't get too worried by it all, do what you can without stressing, and live with it, it's the best you can do at the time! Shouldn't let a little thing like tyre pressures take away too much from the enjoyment of getting out there in your 4By!!

Quote:

Originally Posted by Peter @ Aawen4x4

All this tyre pressure stuff came (some years back) from a tyre guru who had spent his working life in the back rooms of the tyre

companies that spent mega bucks supporting some of the race teams. He had a wealth of knowledge, and had a career that included time with a couple of the large tyre companies, and some of the big names in international racing, as well as successfully running one of the more respected tyre development and testing departments in the world! I was very impressed with his down to earth approach and knowledge, and he spent some time explaining that despite all the computing power that had been bought to bear on the subject of determining the 'optimum' tyre pressure for a given tyre for ALL situations, they still hadn't been able to get anything better than the '4psi increase after an hours worth of driving' and it worked wherever they applied it!

Since then, I've seen it appear in lots of places, the latest being the Cooper and Mickey Thompson 4WD Driver's Guides, where they have a section on tyre pressure, and they lay out the '4psi Rule'! They do suggest to use it only for bitumen road use, and despite being told by 'the man' that it worked anywhere, I too was a little slow to be convinced that it STILL works fantastically for Off-road use, surfaces, and conditions; it's just that the pressures hafta be significantly lower to start with! I suspect that is the reason for the rider in the Cooper and Mickey T documents; either that or they are protecting their butt from some perceived potential lawsuit. But it's worked for me driving trucks & buses, cars, 4WD's, and even tractors of various sorts, in all sorts of conditions, heat, snow, rocks, sand, et al, so don't be worried about applying it to whatever you are doing with tyres, it'll help get the pressures right for whatever you are doing!

So try it yourself! If you seriously give it a proper try, and adjust your pressures in the manner it suggests, you'll get longer life from your tyres, they'll be less prone to puncturing than otherwise, and they'll give you traction, road manners, and ride characteristics that not only enhance the life of the tyre, but make it easier on the vehicle and the occupants! Like they say, use the tyre placard to get a good starting point, then fine tune it using the 4psi rule from there. Use the guides suggested pressures for off-road pressures as a start point too, and then do the fine tuning with the 4psi rule. Again, it'll enhance your driving in more ways than you expect.

One of the first things that I noticed when I started using this rule off road was that when I went driving with others who weren't aware of the 4psi rule 2 things happened. 1 – they bagged me for stopping and playing with tyre pressures; and 2 – they thought I was a much better driver than the norm because I could go places that they couldn't without anywhere near the wheelspin or even at all! The only thing that I could see that was different was that I was using the 4psi rule and they were generally not changing pressures much at all! Now that was a long time ago, and it was when people generally worked on HIGH pressures only for off roading, to allow the tyre to cut thru the goop and get down to the firm stuff etc, and since then the whole ballgame has changed and people are much more aware of using lower pressures to enhance traction, but still, it was a telling point at the time.

What about all the variables that impact on optimum tyre pressures?

The thing to remember about the 4psi rule is that it is the ONLY method readily available to all drivers that ACTUALLY takes into account ALL the variables, cos it works off the driving you've just done in the last hour or so – ambient temp, air temp, road temp, road surface, driving style, load, tyre carcass, tread construction, etc, etc; BUT it IS retrospective – it's based on what you've just DONE – you hafta make a judgement call on what's facing you in the next hour, and adjust pressures accordingly!! (but the 4psi rule will let you fine tune that 'judgement call' into something quite accurate fairly quickly) So it is a system that you need to use pretty much all the time until you get a good idea of what variables make how much difference to your pressures, but I've noticed with all the people I've trained over the years it hasn't taken anyone all that long to get pretty good at getting their judgement calls pretty close within a few weeks of starting 'using' the 4psi rule. So try it, vary your pressures accordingly, and modify your start pressures accordingly, you'll get better as you go along.

The 'calculation' for working out how much to vary your pressures when they are out is just another 'rule of thumb', basically if you take 1/2 the difference between what your tyre pressure SHOULD have been and what it ACTUALLY is, and add/subtract accordingly, and you can keep doing that every 30mins/1 hour if you like, but it becomes a tiny adjustment eventually. The suggestion mentioned earlier works too, you just need to be consistent in what methodology you use rather than exact, same with your pressure gauge – the most critical factor is consistency rather than accuracy.

Tyre Pressure Management Systems

Re the Tyre Dogs and their temperature/pressure variations, I've got a set of them, and I've run them for a long time now. It has become very obvious to me thru using them that the tyre temp reported by them is only very loosely acquainted with what's actually going on INSIDE the tyre, I believe it's cos they are externally mounted on the valves, and they reflect ambient & road temp a lot more than internal tyre temp, AND they are very much effected by external factors such as exposure to sunlight, wind, rain, snow etc rather than showing an accurate relationship between the 'real' tyre temp and pressure. As such, I'm firmly convinced that while their pressure advice is pretty good, and even usually reasonably consistent (altho not necessarily all that accurate) their temperature readings are not something you want to rely on. And sometimes their pressure reporting can reflect only what's happening between the valve and the monitor, not what's going on inside the tyre, so if one Tyre Dog starts showing a higher or lower reading that's out of kilter with the others, it really IS a good time to stop and look for a reason!! But don't assume it's necessarily always a puncture or some other undesirable incident, it could be just that the rubber seal in the base of the monitor has split or it's jammed the valve stem in an odd position. I also run a fairly sophisticated (and expensive) internally monitored TPMS, and I've often run both systems on the same tyres over the same terrain – while the Tyre Dogs have

reported useful pressure data, often the temperature info has been worse than useless – at best it's confusing, at worst it's downright misleading, and sometimes you need to check the pressure readings against your reliable tyre pressure gauge too. So don't pay too much attention to the temp info from any externally mounted TPMS.

BTW, digging thru the coding for the sophisticated TPMS, I came across an 'increase factor' that it uses to calculate the variation between what your current pressure and the 'correct' pressure for that particular tyre is, and guess what??!! Yep, it too uses the 4psi rule to determine the optimum pressure for your tyres!!

Finally, (welllll, almost) your tyres (the rubber bits mounted on the rims) need a certain VOLUME of air to hold up the weight of your vehicle as you drive along. Skinny tyres that aren't all that large in dia need higher pressures to get the same total volume of air when compared with wider tyres or tyres with larger overall dia, so as you swap from the std (& generally relatively narrow) tyres that were fitted by the manufacturer, and fit wider/taller tyres to your vehicle, unless you've significantly increased the weight of your vehicle, you are not all that likely to need HIGHER pressures which would mean a greater volume of air – in fact, you are more likely to need LOWER pressures to give you the same total volume and therefore do the job. And that relates to why the footprint length system isn't quite as versatile as the 4psi rule – the optimum footprint length will vary with the load, tyre construction, tyre size etc, so it's not quite as easy to cater for all those variables in determining exactly what optimum is for YOU. The 4psi rule works on what the volume of air inside the tyre is doing, so it DOES consider all those variables.

And now REALLY finally, some manufacturers have started recommending that for 4WD's we should be using a 6psi rule rather than the 4psi rule. No biggie, a lot of the reasoning behind that is simply that 4WD tyres are generally of a heavier construction than most passenger tyres, and MANY 4WDers have been running cold start pressures that are WAAYY too high, so looking for a 6psi increase means that you are starting with a pressure that's a little lower, but by using that rule you are still getting pretty close to the optimum pressure for your tyres, and if you use the rule (either rule) as a matter of course, you are spending more of your driving time at a better pressure than previously – for almost all vehicles that weigh less than 3-5 tonnes. So if you are running more than 40psi in your tyres, check the sidewalls for the MAXIMUM cold pressure at full load – for most 15" 'flotation' type tyres, the MAXIMUM is about 35psi AT FULL LOAD (and unless you are off on a trip, you aren't likely to be fully loaded) and for most 16" tyres with a sidewall listed max of 55-65psi, MAXIMUM load is up around 2 tonnes per tyre or 8tonnes of vehicle!! And the bigger the overall dia, then the lower pressure you need to get the same total volume of air inside the tyre.

Simple really! Cheers

Quote:

Originally Posted by cac

thx for clearing that one up peter....when running low pressures like on sand though, you really only want to drop your tyres so your footprint length gets longer and not wider don't you??

That's pretty much what happens if you get the 4psi bit close to right, altho there will always be some width increase as the footprint gets longer, simply because there is more sidewall flex possible (but not necessarily 'bagging') As pressure goes down, the more recent design/construction of 4WD tyres will (almost) always mean that you get greater length instead of greater width, and tyres like Coopers, Mickey T's, & even BFG's are made to optimise that feature.

But basically if you use the 'footprint length' method of determining optimum traction/ride/wear characteristics, there is still no hard and fast SET length for every (or even any) situation; the 'optimum length' varies depending upon the same 'whole heap' of variables that applies to the 4psi increase, so what works for YOU in your vehicle with your driving style and the load you carry isn't necessarily going to be correct for someone else in the same car on the same track with the same load, while the 4psi rule is always going to allow you (or anyone else using it) to be much closer to the 'optimum' because of its 'reaction' to all those variables, especially if you then continue to fine tune your ability to get it right. Make sense??

Anything that gives you a set pressure (or length) for any given situation won't be taking the impact of all those variables into account, it will just be giving you a (sometimes) reasonable start point that may well be seriously wrong for today's specific combination of variables. On the other hand, the application of the 4psi rule still allows you to take the (same) reasonable start point, and then take all those variables into account and fine tune the pressure (and therefore the footprint length) to something much closer to the optimum. And as you use it more, you get better at 'estimating' what impact you'll get from today's conditions or what the track ahead looks like, etc, and you get better at picking what your theoretical start point should be and what the resulting +4psi pressure should be.

That practice of taking into account the differences in variables each and every time you drive, and the fine tuning you do by using the 4psi rule and 'regular' checking of tyre pressures will allow you to develop your skills in deciding if you actually want to change (drop or increase) tyre pressures now to suit the expected conditions, or leave them as they are and vary one of the other 'variables' that you have control over, like speed or cornering/braking etc. For instance, the fella who drives a loaded work vehicle over a range of terrain every day might need to spend a little bit of time initially in developing the skills to estimate what changes he needs to make so that he's not always getting out of the vehicle and changing pressures, but once those skills are developed, he'll be able to vary other things like speed & cornering/braking techniques so that he can still get the best from his tyres across a range of surfaces & under a range of conditions given the pressures he's currently running, and without adversely

effecting his tyres. If he doesn't develop those skills, it'll show up in the greater wear of his vehicles' tyres over those of other 'more skilled' drivers (greater wear as well as chipping & cutting, losing tread blocks etc), as well as showing up in the lesser overall traction obtained, the poorer ride, & the greater stresses on the vehicle; and therefore the higher running & maintenance costs for that vehicle. Just like a good race car or rally driver develops skills that allow them to get the best from their vehicle and actually finishing the race with a good placing rather than leading early but destroying tyres thru trying too hard and eventually getting overtaken and beaten, IF they manage to finish. It just takes longer to show when it's a 4WD that should be able to get 80,000km plus out of a particular brand of tyre rather than a race or rally car that does its whole bit in less than 500km, but the skills are no less as important.

Ambient Temperature & its impact on tyre pressures

Ambient temp certainly is one of those things that has an impact on your tyre pressures. Basically, colder ambient temps means that '1 litre' of air will actually occupy less space than it will at higher temps, so while you got away with x litres in Melbourne, you'll need x+ some if you are further North in the hotter country, ie you'll generally need more air inside your tyres to carry the same load when it's hotter, and it's the volume of air that does the work. So you shouldn't be just setting your pressures in Brisbane and expecting the same pressures to work in the quite different environment/ambient temps found in Vic, it's a dynamic/pro-active thing and it needs to be monitored and adjusted as the any of the variables change, ambient temp being just one of them. BUT, by doing the 'hard work' early in the piece and paying attention to what's going on around you and your vehicle as you check and monitor your tyre pressures, it won't take you long to be able to make a good estimate EVERY MORNING as to what impact the ambient temp of the day is likely to have on your 'standard' bitumen road start pressures, or your 'standard' dirt road pressures, or even if you like, your 'standard' wet weather fully loaded bitumen road pressures. So you adjust your cold start pressures accordingly, then use the 4psi rule to fine tune those settings during your day's driving, as the tyres are subjected to all those variables. Make sense??

And certainly your tyre pressure/temp monitoring system can and will help, altho I've previously mentioned the problems associated with external (valve mounted) sensors, and how they are effected by external air temps & conditions more than internal tyre air temps especially when you compare the temps reported to those from internal sensors. Basically, I wouldn't be reading too much into the temps reported by externally mounted sensors, altho any significant changes are certainly worth looking at, even if just for your own peace of mind.

The pressure/temp variances you saw with changes in direction due to the sun heating up one side of the vehicle are also quite common, but you don't necessarily hafta make adjustments immediately due to that sort of 'slight' variation – you need to allow the effect of the road & load on the tyre to take precedence, hence the need to drive for an hour so that those 'slight' variations get swamped by the overriding effect of road surface/load/driving, etc. I often park my vehicle such that one side gets warmed (quite warm) during the early morning, but thru application and monitoring of the 4psi rule I know that the 1-2 psi differences in pressure between the sun warmed side and the shaded side will very quickly be ironed out once I start driving, even just a few minutes at highway speeds. So it comes back to using the 'rule' and getting to know how all those variables affect pressure/temp etc. Actually do it for a while and it'll fairly quickly start to make sense, as you've already noticed.

And if you are running tyres that are significantly larger than those designed for the vehicle, then you can run into the 'problem' of the tyres never warming up enough to gain that magic 4psi increase, BUT, since others mentioned the same effect to me, I've played around with big tyres on little cars quite a bit, and the 4psi rule STILL WORKS, but there is a point of diminishing returns, ie, your tyres can actually be too big and hold too much air for the weight of your vehicle to actually heat the tyres up to their optimum pressure/temp, so by default you are actually getting less than optimum traction from them, ie not exerting enough pressure on the ground to provide the optimum traction from that tyre. But then if you are wearing tyres that big (or so heavily constructed) under such a lightweight vehicle, then there are probably other reasons that you've decided hold higher priority than the absolute optimum in traction, or have you?? Still, when you run large tyres and get to that point under a light vehicle, you can assume that "if the pressure doesn't change then the tyre pressure is correct for that sort of driving", altho I'd argue (and I've observed sufficiently to satisfy myself) that you can still actually get better traction by using any one of a variety of methods to reduce the volume of air carrying the vehicle such that the 4psi rule is satisfied, altho you might not want to add weight to the vehicle, fit smaller tyres, fit larger diameter rims, or fit internal bead locks, et al.

Enjoy

Long Distance Travel

The 4psi rule pretty much applies everywhere, even on long distance travel; BUT, just like your vehicle 'glove-box' manual will tell you, or maybe even the tyre placard – long distance travel or fully loaded driving will need slightly higher pressures to normal. So you still use the 4psi rule, but you need to set your 'cold start' pressures in anticipation of the driving you are going to do. So if your normal driving pressures work out at say, 26psi; then if you are preparing for on a longer trip, a fully loaded trip, or today's driving will be on already hot bitumen, then you are likely to need higher start pressures – say 28 or maybe even 30 psi. Just like when you are driving off the bitumen onto a dirt road – you should really be looking at dropping your tyre pressures, or at least slowing down so that you aren't running pressures that are too high for the surface/conditions (remembering that tyre pressure responds to a range of variables, speed & track surfaces being just a couple of them!) Make sense?

Stone guards

Re the flappy stone guard things right across the back of the underside of a towing car, lots of modern vehicles use a ‘thermo-syphon enhanced cooling system’, where the fan itself doesn’t actually pull enough air thru the radiator to allow full cooling – the ‘syphon’ system relies on the air flow from the moving car adding to the total air flow thru the radiator, meaning you can get away with less in the way of power sapping fans. And once the air flow thru the front of the car is channelled thru the radiator, it then continues past the engine, then down and out under the car, cooling other components as it goes. That down and out bit is aided by the venturi effect created by the high pressure area just in front of the firewall & under the bonnet actually ‘forcing’ the air down and out, and further enhanced by the air flow over the top of the car and down the back creating a low pressure area at the back of the car, so the air flow is basically sucked out from under – all aerodynamic stuff that can get pretty hi tech; and not surprisingly, even a little change under the car can make a big difference.

And like others, I’ve noticed that those large flaps across the back behind the wheels can (and do) make a big difference to tyre temps (particularly the rear tyres), and if the ambient/road temp is high enough, they can be detrimental to other things as well. If you ever get a chance to play around with temp monitors on other components, you’ll also see that those big flaps play havoc with the temps in the diff & rear axles, and even the temp of the fuel in a tank mounted behind or above the flap.

One vehicle we were running mainly on neat veg oil needed a pre-heater to run properly until we set it up with a full width stone flap behind the rear axle and in front of the fuel tank – saved the need for the pre-heater completely but we couldn’t stop the shocks from ‘cooking’ and fading. When we took the flap off, shocks lasted a helluva lot longer, but we had to re-fit the pre-heater just to keep the engine running. Had us puzzled for a while, until it dawned on us exactly what was going on with the air flow and how much it actually cooled things down under the car.

So if you are already (or are thinking about) running larger than normal ‘mud’ or ‘stone’ flaps under the car, just be aware of the potential for over heating problems, and not just necessarily the engine!! But then again, not everyone works their vehicle hard enough or drives where ambient/road temps make it an issue. F’rinstance, I doubt that anyone who only ever drives in Sthn Vic would even notice the difference, unless they could see it on remote temp sensors (like those in most tyre monitoring systems).

Cheers

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