1/12th Scale Tyre Diameter Selection

A Definitive Guide for Drivers of All Levels

Background

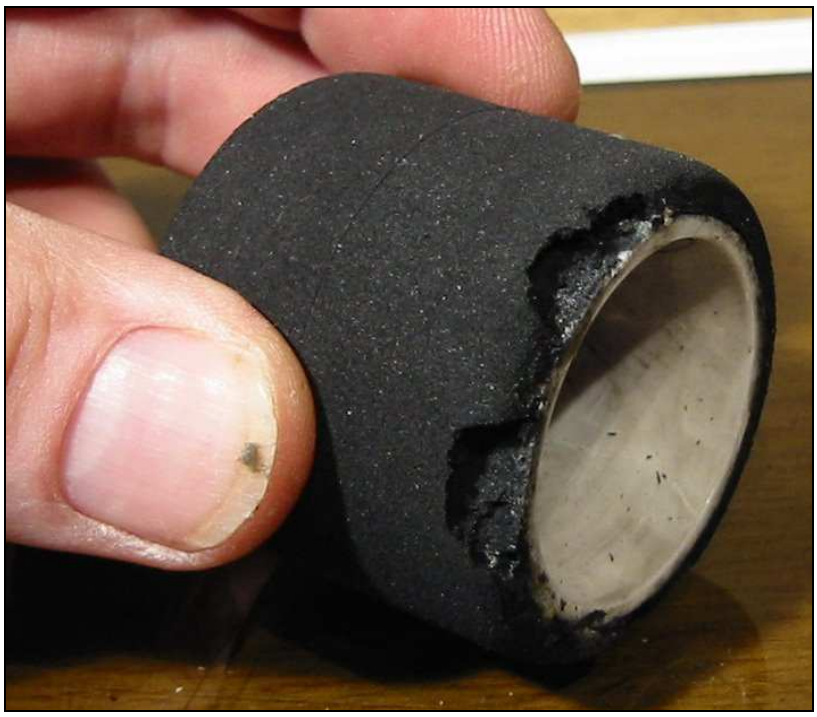
On any racing car – full size or scale, the tyres represent the most important factor in determining the handling capabilities of the car. The tyres are the only parts of the car in contact with the racing surface and as a result all of the cornering forces, pressure and friction which combine to generate grip are transmitted through them.

For 1/12th scale racing, the tyres play an even more significant role since they can be finely tuned to alter the handling characteristics of the car. Both the compound and diameter can be changed as well as the additive application procedure to create a theoretically endless list of possibilities, and an incorrect decision relating to any one of those possibilities can have a seriously detrimental effect on the cars performance.

This article aims to identify and explain some of the major pitfalls associated with tyre diameter selection. It is by no means exhaustive, but it should provide a useful insight for drivers of all levels. The theory applies to all makes/brands of tyre.

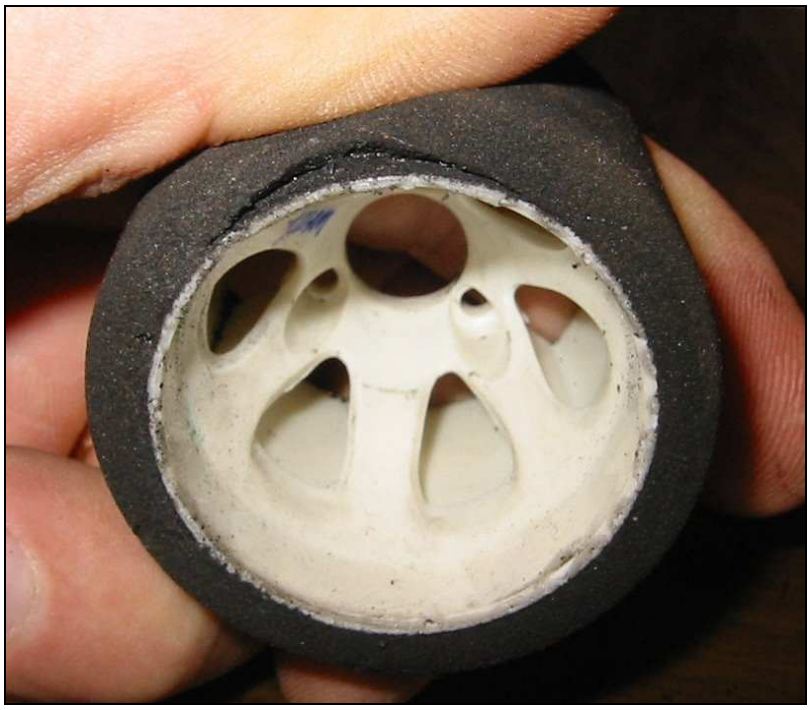
Chunky!

If you look around the pits at a national you'll see people using tyres in varying conditions. One thing is true of all the guys who make the A-final though – their tyres are not chunked! 1/12th scale cars run with no rear camber, so the outside edge (or sidewall) of the rear tyres play a significant role in determining the handling characteristics of the car. When you turn into a corner, most of the pressure (and therefore lateral force) is generated at the sidewall of the outside tyre before dissipating through the rest of the tyre. So what happens if the tyre is chunked and there is no sidewall? The car slides as the required lateral force is not generated. The bigger the chunk, the more prominent the slide will be. You can often get away with one or two small chunks, but even these introduce an element of unpredictability to the car. For this reason, the top guys will almost never be seen with chunked tyres on their cars, particularly at nationals. Chunks in the middle of the tyre have far less of an effect – it's the ones on the sidewalls that cause problems.



Try to avoid running badly chunked tyres

Peeling is also something to watch out for. Again, this usually occurs on the rear tyres as the foam is softer. A tyre peels as a result of large cornering forces, poor gluing or a combination of both. When it happens, the tyre literally tears away from the rim right next to the glue join (much like a welded joint will fail next to the weld, not on it). Peeling affects the car in much the same way as chunking, in that it prevents the tyre from generating the lateral force required to keep it on the track. Peels propagate along the edge of the rim if they aren't fixed, and will eventually lead to chunks as well. The best thing to do is check for peeling before fitting the tyres to the car; if you find an edge to be peeling away, a blob of contact adhesive left to dry fixes the problem. Also use a truer to sand off any glue spilt on the top surface of the tyre.



Peeling causes inconsistent handling and also leads to chunking

It is possible to take measures to prevent a peel/chunk occurring during a race; these are outlines in the tyre truing and preparation article which follows this one. The bottom line is; try not to run chunked tyres in important races, save them for club racing if you have to use them.

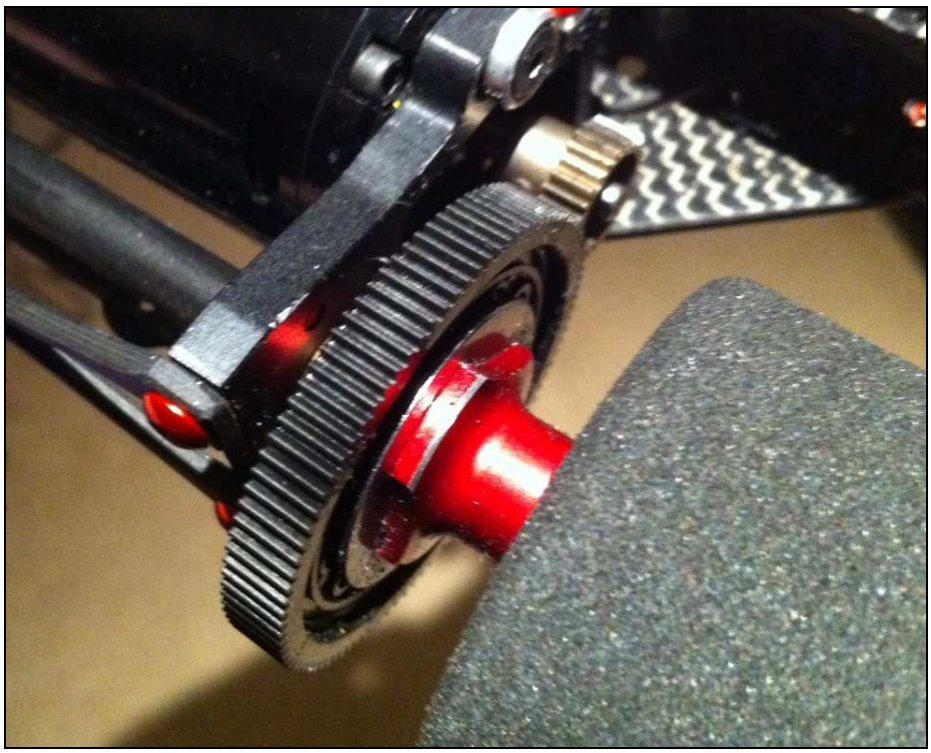
What Else Changes When I Change The Diameter of the Tyres?

Front

The obvious change that occurs as a result of modifying the front tyre diameter is ride height, so whenever you fit a new pair, check the ride height and adjust it accordingly. Changes in ride height also affect the roll centre as the height of the wishbones relative to the chassis changes. This highlights an important point about any area of car setup; making a change in one area always result in a subsequent change somewhere else! Car setup is a trade-off; you get nothing for free, and it's all about finding the best compromise.

Rear

The ride height will also change on the rear end if you fit a pair of different sized rear tyres, so again make sure you check the ride height following fitment of a fresh pair. The other big change is gear ratio; you rollout is dependent upon tyre diameter. A change in rear tyre diameter of just 1mm can alter the gear ratio by as much as 1.5mm/rev, so it is perfectly feasible to expect to have to fit a different pinion gear if you change the rear tyres.



The gear ratio will change with different sized tyres

If you're running small rear tyres, also be sure to check that the spur gear has adequate clearance and is not at risk of touching the deck; it is advisable to make sure that there's a gap of at least 1mm between the bottom of the spur and the ground when the car is race-ready.

What Size Tyres Should I Run?

As a general rule of thumb, when the grip is high smaller tyre diameters are better. A tyre with a small diameter has a shorter sidewall which will not flex and deform as much during fast cornering. A car running on a high grip track with small tyres will corner flatter, be more responsive and generally look and feel more 'dialled in'. Running tyres that are too big increases the chance of suffering from grip roll and will make the car feel lazy and soft during cornering.

It is usually beneficial to run slightly larger tyres on low grip surfaces (club racing and Saturday morning at a national). The extra sidewall flex they offer will make the car a bit more forgiving on a surface which is essentially less forgiving.

It is up to the individual what size to start tyres off at; it's a trade off between performance, economy and strength. For national competition on high grip tracks, smaller tyres are definitely best, so save all your small, un-chunked rubber for big events! For a national it is best to use tyres that are no bigger than 44-45mm on the rear and 42-43mm on the front. If you're a regular club racer, run them bigger than this at club events and then save them for nationals after they've worn down a bit. If you only race at nationals, it is advisable to start them at the kind of sizes quoted above.

Most of the top drivers run small tyres at national events

A larger tyre is more at risk of chunking, so running them really big to start off with to try and get a long life span is often a false economy, as they chunk before getting down to optimal diameter. The additive we use also dissolves the compound to an extent, so after repeated additive application they will start to go soft and 'gummy', which is not desirable. Running anything bigger than 46-47mm on the rear and 44mm on the front really isn't worth the hassle or the chunking risk.

Stagger

The basic guideline here is 2mm; try to run tyres that are about 2mm larger on the rear of the car to achieve a good handling balance and feel in the car. You can modify the stagger to fine tune the handling of your car, but the effects are relatively small; the top drivers rarely deviate +/-1mm from the recommended 2mm. Never run larger fronts than rears, and never go beyond a stagger of about 3.5mm. There is a saying which states "if it looks good, it'll go good"; this applies to tyre sizes. If the front and rear tyres look in proportion with each other then the actual stagger amount is likely to be somewhere near.

Racer's Choice

In practice and the early rounds at a national I usually run slightly bigger tyres than I plan to end up on later in the day. 44-45mm rears with a stagger of 2mm is about the biggest I'd run for practice. I don't do much club racing so they are trued to this size from new. Once the grip comes up, I'll run anything from 44mm down to 41.5mm on the rear with a stagger of 1.5-2mm. You can get away with running really small rears (<42mm) if the compound is hard enough; pinks and magentas are usually OK, but yellows are softer and wear more quickly, so would most likely wear out during the run.

Lots of people try and run big tyres to get longer life out of them, but as has been mentioned in this article it's often a false economy as they end up chunking more easily. With a wear rate of about 0.4mm per run on rears it's entirely possible to true a pair to 45mm and get 8-10 runs out of them, which is more than acceptable for national competition in my opinion. – Mark Stiles

Summary

That's about it for tyre sizes. As you have probably gathered, there's lots to take in and learn. Hopefully this article has enlightened you as to the potential benefits to be had from careful selection of tyre diameters. It is by no means exhaustive though; as you gain more experience you will find that tyre diameter selection plays a major role in finding a good setup for your car. Getting it right can often give you a slight edge over the competition.

With regard to starting sizes; the best advice is to use your own judgement. It's usually a trade-off between ultimate performance and economy, and the only person in a position to properly judge that is you.