

In all motorsports, there are similarities that are consistent throughout. All vehicles have motors, drivers and steering wheels. Almost all land-based racing have tires. That means that no matter what you are racing, from karts to Indy cars, knowing how to properly use your tires is the single most important factor in learning to race successfully.

While any number of factors play into how your kart performs, it is the manner in which the tire contacts the racing surface that ultimately decides how fast a racer can go around the track.

There are a few easy ways to diagnose basic tire problems.

"The big word in tires is consistency." Says NKN test driver and WKA Gold Cup Grand National Champion, Billy Dickson. "In setting up a kart, the best thing to have is all four tires working together to keep the kart on the track." Also, keeping the amount of work each tire does spread across its entire contact surface is important as well. Toe, caster, camber, ackerman, stagger, crossweight, transfer weight, torsion bars, center of gravity and many other factors all affect how tires perform."

Tires perform best when they are run within their specific temperature range. If a tire is too cold, it can slide across the racing surface, or it can pick up rubber from the track, causing them to be laden with rubber. Tires that are too hot will most likely begin to blister or feather, again resulting in less grip. This is where the compound begins to break down and air pockets begin to form on the

Listen To Your Tires

They know what they're talking about.



Other than a slight amount of inside wear, the tire is worn well – Basically what a good working tire should look like.

tires surface. They may be minimal, or quite dramatic, depending on the racing situation.

A tire, if run perfectly, should have an even amount of smooth wear across its surface with no blistering or buildup.

"Before diagnosing your problem, it is important to know that remedying one problem with a chassis adjustment like a caster or camber change will likely have an effect on how your kart handles through the corners. It is a delicate balancing act between maintaining your tires and

getting around the track fast. "Getting it right is what racing is all about," said Dickson.

According to Mike Combs formerly of Intense Karting, "It is also very important to scale your kart properly before trying to do any effective testing at the track. Without knowing that you have the seat placement and cross weights correct it will be very difficult to diagnose any problems."

Another hint is to be sure and occasionally calibrate your tire gauge to be sure that it is accurate. An inconsistent unit can cause many problems before a racer even hits the track.

"Your tires will tell you where the problems are," said Combs. "At our track, many karts will develop a

push through the turns. The telltale sign is that the front tires will start to feather, usually on the inside of the tire. This means the front tires are sliding rather than gripping.

To correct for a push, you need to plant the front end more and give the tires more grip. We widened the front tires. For more extreme pushing, we added a front end bar - if the kart has torsion bars. Doing so may require you to narrow the tires back down. As you get closer to the proper setup, the feathering should lighten.

If the back of the kart becomes loose, then the rear tires start to look rippled, almost like they are being shredded. This is the opposite of a push. The sign of being too loose in the rear is if the kart starts to hop in the middle of the corner. Narrowing the front tires or removing a front bar should help the problem. Lowering the front frame height may also help to free the front end up.

If the back of the kart is sliding at the entrance of the corner, the rear needs more bite. To stiffen the rear you can resort to longer hubs, a stiffer axle or stiffening the seat struts to give the back more bite. Adding caster to the front kingpin will also increase grip for the whole kart," advises Combs.

"If our chassis is binding up or chirping in the corners we know that our tires are running too hot. Usually we will see blistering that will confirm this. This is caused by the chassis getting twisted in the corner and then it wants to rebound or unwind too quickly. According to Dickson, "To cool the tires on an American chassis, we will start by widening the wheels out so that the kart doesn't transfer as much weight going into the turn. I know some European karts will make just the opposite change. Taking caster out of the front end will help as well. This reduces the amount of arch that the spindle travels, thus the kart twists less. If everything on the setup is working well, we will sometimes switch wheels and put the tire on a wider wheel to stretch it out. We might take a 6" tire and put it on a 7 1/2" wheel. This makes

This is a prime example of excessive blistering. There are several small ripples. This can be due to aggressive toe in or too much negative camber.



The air pressure in this tire was too low. The tire surface is very contorted and the outside edges show the effects of too much sidewall flex, thus the shredding of the outer edge.

the sidewalls less flexible, again this reduces how much the tires flex, thus the tires will run cooler and more free in the corners.”

If a tire is blistering on the inside it may be due to the kart having too much toe in on the setup. (see toe definition in terms section). While toe may improve how the kart handles in the corners, it may be counter acting the direction of the kart, causing the inside surface to be most affected. Another problem may be the camber. Because camber affects the surface of the tire that contacts the pavement, having too much negative camber will also cause the tires to wear on the inside.

If the tires are wearing on the outside, the opposites may be true for the camber and toe.

If the tires are wearing on the outside and the inside, but the middle is clean, you may be running too low of air pressure. Adding air pressure increases the circumference of the tire. Again, the converse may be true. If your tires are wearing only in the middle, the sides may not be getting enough of the work. Remember consistency is key.

If your tires are picking up a significant amount of rubber on the track, your tires are likely running too cold. “If you came in on a cool down lap and you see

Important Terms

- **Binding** - A term used to describe a handling problem when the frame tightens in the corners. Usually the reason is too much rear grip or side bite in the tires.
- **Blister** - When the rubber on a tire gets excessively hot thus melting small patches of the tire causing it to bubble. It also shows a breakdown of the compound causing the tire to become oily thus losing grip.
- **Camber** - Camber is the number of degrees that the top of the tire is tipped inward (negative camber) or outward (positive camber). It affects handling. Most karts are built with some degree of negative camber. Most frames are now designed with a camber adjustment by repositioning the kingpin.
- **Caster** - It affects handling and refers to the number of degrees the top of the kingpin or spindle leans towards the rear of the kart. Many frames now offer a caster adjustable front end as standard equipment.
- **Compound** - Refers to the different grades of tires. Different compounds have different rubber formulas. It can refer to the relative hardness of the tire.
- **Contact Patch** - The area of the tires that makes contact with the racing surface. Air pressure, the load on the tire, caster and camber adjustments all factor into the size and performance of the contact patch.
- **Load** - The tire load refers to the amount of weight placed on a tire. The heavier the load, the bigger the contact patch and the more grip the tire should have. This load shifts throughout a race lap. In every corner the load is shifted to the side, during acceleration it is shifted to the back, and under braking it is shifted to the front. Tires are constantly being loaded and unloaded.
- **Sidewall** - The outside wall of a tire. Directly affects how the tires and chassis performs under load. Often referred to as sidewall flex.
- **Spindles** - Are another term for the front axles or what the front tires are mounted to. The spindles are mounted to the kingpins, which are mounted to the frame. This makes them highly adaptive to different setup configurations using caster and camber to adjust the chassis' performance.
- **Toe** - Refers to the angle of the front tires when looking at them from the top. Toe In refers to the front tires pointing towards each other to a point at the front of the kart. Toe out refers to the back of the tires pointing towards each other to a point at the rear of the kart.

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rubber building up there is a problem. If you come into the pits and your tires are under 100 degrees then your tires won't perform the correct way. A good range is between 110 to 130 degrees all the way across the tire. So you need to increase the heat in the tires. Increasing the air pressure should help. This decreases the amount of tire that is contacting the track. The center should heat and disperse across the surface of the tire. Going to a narrower rim or a softer compound will increase the flex in the tires, and more heat will build in the corners. Adding caster increases the lift on the inside rear tire and the amount of twist the chassis

gets in the corners. This increases the load on the tires and operating temperatures."

There have long been debates on compressed air versus nitrogen. According to our resident racer Dickson, the choice is simple. "We carry both. Air carries excess moisture as do the tanks. Keeping the air dry under all conditions is a lot more difficult than just having another tank of nitrogen. If we need to increase the temperature in the tires, we run air (knowing that to some degree they will increase in temperature throughout the race). If we want to run cooler or more consistently, we will run nitrogen."

Combs adds, "We will use nitrogen when we know that the tires are running hot, but the tires aren't giving us an indication of why."

According to Dickson, some racers have turned high tech in managing their tire pressures. "I've heard of some racers using bleeder valve stems on their tires. A racer can pre-set the valves at 12 pounds and throughout the race as pressure builds in the tire the valve releases the excess. I don't even know if they are legal, they are on the inside of the tire so they can't be seen. They cost about \$200.00 a set, which is just another expense to consider."

When learning to maintain your tires, there is still no substitute for simple practice. "What kills me is the number of racers who put their kart away Sunday night and get it out the next Sunday morning and expect they are going to win races. In our program we do extensive testing and record keeping so that we know what to do in certain situations. We also maintain our karts. We



Here is a prime example of excessive blistering.

lubricate and clean the bearings, tune the clutch and minor things throughout the week to make sure we are ready to race. Many times local racers think that the guys on the national level only know how to cheat to win. When we kill them at the local races they want to look at tech and find out where we have cheated instead of looking at our program and understanding how much we put into it week after week. We come to win, whether it is a national or a local track. We have records clear back to when we first started. Every track, and event is there for us to reference. Everyone on the national level does this. That's the key to winning in racing," said Dickson. **NKN**



The entire tire is heated and blistered. It's time to go to work.

Alan Rudolph-SKUSA SuperPro Eastern Division Champion

Franklin Motorsports PCR/Swedetech Yamaha - Photo: Sean Buur

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