Tire Management…

Racing tires are very special and because they are run so hard the rubber compound structure must be kept thinner than street tires in order to properly dissipate heat. In street tires, heat causes the tire to blister and in many cases premature wear is evident. The battle at government infrastructure does not help at all. In order to increase traction and keep the average driver safe, the material used to lay down the road or highway is very abrasive. Street tires must be thick and hardness can be a factor for both traction and wear.
The compounds for "asphalt racing" are rather simple. They are thin tires and at speeds near 200 mph these tires wear out around 45-55 laps on a ½ mile circuit. There is not much racers can do with racing tires on asphalt…"put on two or four".

Now, dirt track racing…that is a totally different animal.
Starting with tire manufacturers and designs; engineers balance compounds with thickness. The side walls are engineered much different from the tire patch or traction surface. Some are pre grooved with a specific pattern; these include "cross block", "chain link", "angle and stagger block". Some dirt tires come with "longitude" groves around the tire, this pattern is "rib", which allows racers to groove and sipe as needed, as desired.

I am not going to talk much about compounds here. Needless to say too many racetracks use tires as a balance device between track management and quality race events. This is what we call "rules" and all too often these rules are worthless as tits on the bull's ass. Tire rules cost racers money because one manufacturer is generally specified, and that is a monopoly. NASCAR started specifying tire rules long ago and they still can't get it straightened out. Tire rules are hit and miss, that is to say they are generally "too hard" or "too inconsistent". These rules are designed to minimize the track preparation during the total show and keep the program running. I must say, if the program runs smooth and the racer can get a couple nights out of his right rear tire, the rule is fine, but all too often that is not the case. One local track here in WPA enacts an extremely "hard" tire rule. Not only does this force outsiders away…it leads to "follow the leader" racing that bores the fans to tears.

What makes "dirt racing" the challenge that is; simply stated…tire management. Dirt racers today understand that the "groove is in the heart". Only the pure stock and modified racecars are bound by limited tire management. They run specific tire patterns and structural surface changes are not allowed. The Street Stock, Sportsman, Sprint, Silver Crown, Midget and Late Model divisions require someone on the team understand tire management. Several of these classes run on 11 inch tread width. The compounds range from 1200 (soft) to 1600 (hard). Most racers purchase these tires in the "Rib" design, with diameters between 28.5 and 29.4 inches. The circumference ranges between 88.5 and 92.6 inches. That said…I leave the rest up to your "tire-guru". He is the guy…the man…the "know it all" and his value to the team is priceless.

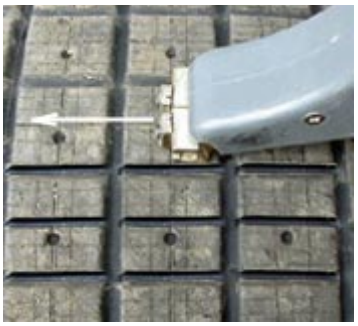
So what does the GURU actually do?

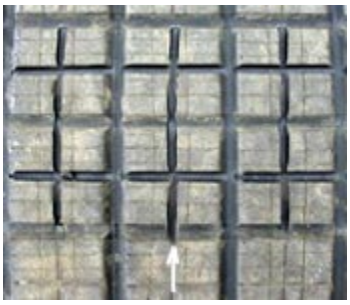
Like I said he or she manages the tires. This is a huge job and requires a lot of time studying track data, weather conditions, driving style, chassis modifications, ballast placement and finally, team budget restrictions. The unlimited team buys tires like kids buy candy. You can't have enough "sugar" in the shack. For these teams, the win is in the balance of tire management and poor administration could lead to another DNF. Tires are this important. If you can't afford a few tires, get out of racing now, I know what they cost and I gave a lot of them away.

The "Rib" tire is for grooving. The patterns, five longitude lines around the car are designed to channel the water and soft clay. There are no "paddle" groves and no "rudder" grooves. These tires are not generally run without additional grooving, and the five "stock grooves" do not offer enough "side bite" to those drivers running "flat foot" around the top.

Grooving:

There are three specific groove patterns to take. The first and foremost is the "paddle". Like that of a paddle wheel on water (boat) the number of paddles, wheels, depth and angles to the water does make a difference. If you don't think this is real, look at the conditions paddle wheel boats operate on. They must paddle up stream, control downstream and fight cross stream. There is good reason why paddle wheels are large and move consistent to the water flow. The captain is trying his best to navigate and maintain relative speed. The single wheeler relies on a rudder system; the double wheeler relies on paddle speed left to right. We are interested in the two-wheeler…because our Street Stock is driven (paddled) by two rear wheels. The "paddles" are the latitude grooves we place across the tire surface. These grooves can improve "forward bite" and generate the "paddle" effect that drives our racecar. Recommended width is no wider than 7/32". However groove width depends on the tire compound. Softer compounds may rip or peel back as the tire heats up. Harder compounds such as 1600 will handle grooves up to a 1/4 inch wide on certain tracks. Keep in mind that balance is more effective left to right when the tires are properly grooved to work in combination. *For example, over-grooving one corner more than the other can help turn the car, or push it toward the outside, and you know what that means.*

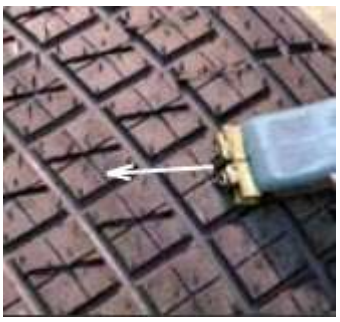




Grooving for "side bite" is done by grooving longitudinal to the tire circumference. This is also known as vertical grooving. The "Rib" tire comes with 5 of these grooves, but you can add grooves as needed. These grooves work well to hold the rear of the car from coming around too soon. They also work well holding the car straight when accelerating off the turn.

Again use caution when grooving a tire that is a soft compound. Adding additional "side bite" should begin with the right rear. *Example, you may experiment with right over left rear side bite grooving; but try not to over-bite the left*. I mean don't soften your rear roll axis for the sake of side bite. Consider "the right-bite" or your racecar will be tight! Up front is a different animal so look at the "rudders"…the diagonal groove.

TIP: The depth of the groove is important, use your tread depth gauge and try to maintain a consistent blade depth without gouging into the tire. You can take a 1/4 inch drill bit and set it in your drill just above groove depth; this way you won't drill into the tire. Now drill small holes into the block centers that contact the track (scrub patch). This will help if you are blistering the tire. Most likely the tire compound is too soft for the track conditions.



The rudder groove is an interesting way to add a combination of both "forward bite" and "side bite". This groove is often used on the right side tires to aid in steering the car. All the same rules apply to diagonal grooves as they do to "paddles", but the angle of the cut is obvious. The deeper the angle the more "side bite", the less the angle the more "forward bite". If you apply the "paddle wheel" theory you begin to understand how this can aid steering down into the turn on entry. Grooves cut at 45 degrees will offset and balance the forward bite as the car steps out. *Example: When considering "rudders" think about how much forward bite you want when compared to side bite*. This is where the rubber hits the track, a professional tire expert can tell just how much is needed and where to apply the proper bite. These grooves are driver independent and must be applied carefully.

Siping the tires…

Siping "fires" the tire up at the surface. After the tire reaches proper core temperature the sipe cuts open up and function as heat exchangers. On the "scrub patch", they allow the block to take traction faster and help eliminate blistering in the tire. Sipes can be done vertical, horizontal and diagonal. There are several siping tools on the market. Keep in mind; you do not want to sipe below 1/2 inch. *Understand, proper siping requires more than a few cuts across the tire.* These small cuts into the tread block help generate traction on hard slick tracks where a light dusting can be seen swirling above the car.

Tire Management, using the Pyrometer:

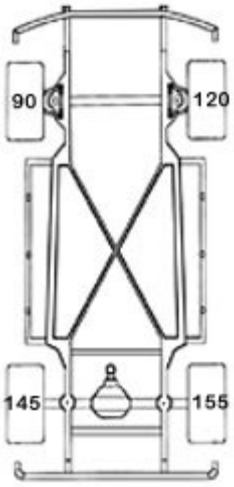
Using the Pyrometer is the best way to read your tire temperatures.
For most 10 inch dirt tires a good pyrometer with a 1/4 inch tip should work fine. What is important, read the tires immediately after the car comes to the pits. Start with an outside block, then move to a center block and then the inside block. Do not accept an average, mark down each reading. If you sipe, get the probe down in as deep as possible. Build a database and work off the information. You need to know air temperature around the car, the number of laps run and the track condition. A dry slick track will heat tires faster than the "sloppy goo" normal during "hot lap" sessions. *Example; the probe should be used three times on each tire*. Evaluate stagger and camber information along with your readings. Numbers for the RF and the RR are very important. Always start reading the right front and rotate around the car, reading the left front last. I have placed a spreadsheet for download in the appendix.

Using the infrared scanner is perfect for surface temperatures and these numbers tell you where the heat is coming from. The scanner is a valuable tool, but what you are not seeing is how deep down the heat is penetrating. However, if the car is loose off the turn and you are spinning the tires down the straight, the scanner will tell you which area you need to concentrate your adjustments. These readings should be taken in three locations across the tire, and an average will tell you a lot about what the car is doing and may need.

You can scan the spindle end and the brake pads too. This will give you data regarding your brake bias and any possible bind or drag at your wheel bearings. Also scan the rear end housing, the axle ends, the headers and the power steering pump. This can display more information that could be a warning of something pending…heat is one thing, friction is another issue entirely.

Tire Pressure:

The heart of tire management begins with tire pressures. Race tires are designed to gain pressure with heat and the result is expansion. This expansion can raise the tire pressure and its circumference dramatically. If you scale your racecar week to week you already know that adding a few pounds to one corner effects the opposing corners. You can increase cross percentage by 1 or 2% simply adding air pressure. I suggest you learn how to use this anomaly to your advantage.



Note: See the appendix for my tire management formula and scoreboard.

If you maintain proper weight and percentages across the corners, you understand that balance across the rear tires is very important. *Example: If the RR is running 30 degrees hotter than the LR, you are not driving the car off the turn, instead you are spinning tires.* You are losing precious lap time and burning off an expensive tire.

The same thing goes for the front; however we want a temperature that shows our RF is working harder than the LF. The higher you run on the top of the track, the less temperature you should see at the LF corner. If you bottom feed, tire temperatures will reflect driver style, corner entry and corner exit.

Reading pressure does not tell us as much about the tire as it does about the track surface, the driving style and the compound choice. Tire pressure can inform us an adjustment may be in order. That adjustment is up to your crew chief, but the data must be accurate and it must be up to the moment. Simply looking at corner temperature is not the answer. Your chief must see all corners at one time and realize what the car is doing. Driver feedback is also important because you are playing with a very large portion of your team's racing budget.

I hope you understand, tire pressure is very important, but tire temperatures tells the real story. You can only guess what a corner is doing by reading pressure. The tire can gain a pound simply sitting in the pits with the sun beating on it for an hour. The proper tool is the pyrometer and don't leave your shop without it.

One more thing…don't be afraid to ask an expert. Pick up the phone and call Hoosier. They have a great technical staff and many of them are racers. They can help, but only if you have your facts in order. The technical staff can tell you how much a specific tire will balloon, with each increase in temperature degree. There is a huge advantage to know this before tuning with tire pressure.

Finally…what procedure is the best?
There is no set procedure that is up to your crew chief. He may want to do tires himself or have someone do the stats and he does the final analysis.

Give each wheel and tire a specific serial number. Paint the number on the wheel. As an example my RR wheel is a bead-lock so I number it RRBL350-620. That is right-rear, bead-lock, Hoosier 1350 mounted June 20th. I take pictures of the groove pattern we apply and then keep that image with the tire data. Any changes are listed in the database, which includes events and number of laps.

I have a style all my own. I have tire sheets that I use, and the data plugs directly into a spreadsheet that does averages and totals for me in my office. I look at the video I get from the crew members and then decide if the car is too loose or tight. I see the entry speed and compare it with the competition. I can generally tell if we have a setup that allows our driver to compete. The only data I can count on is the data I take myself with temperatures, pressure and circumference before and after the race. If I have done my job, three of the tires will increase at a consistent rate so the balance of the car is not upset at the corners. I really don't pay much attention to the LF unless I believe it is running warmer than usual. I want my rear tires to work together while the RF handles the turn entry. If the RF is hotter than the RR, I have a serious problem in my setup…I better loosen the car on turn entry. I hope to maintain a basic temperature ratio between the RF and the RR. For each 7 degree increase in the rear, I want 5 degrees in the front. *Example, if my tires start at 80 degrees and end up with 160 in the RR, I have an 8 times heat increase, that should have my RF in the 120-130 range*. This number may not work for your type of setup and your driver style, so do the math and decide what ratio you want front to rear.

Keeping the data…check the tires across the width, start on the outside and work in. Now scan the tread surface with the infrared gun, now have a crew member check circumference and pressure. You average this number with the setup pressure prior to the event, and compare to the increase in the tire overall. This gives you a growth value of that tire.

Appendix:
https://www.hoosiertire.com/assets/Dirt9.pdf
Hoosier Tire Compound Chart.

Church's tire management formula and score board.
Formula: (AT multiply by TP)/2 = EOR
AT - Average tire temperature (taken from three points on the tire)
TP – Tire Pressure (taken at end of race or test session)
EOR – End of Race (or run) score.
Left Front: 95 x 10 = 950/2 = 475 – Right Front 122 x 13 = 1586/2 = 793
Left Rear: 145 x 14 = 2030/2 = 1015 – Right Rear 156 X 15 = 2340/2 = 1170
Now chart that information for each corner. The higher the score the more that corner is working. This is your tire score board. Armed with a "score card" you can keep week to week data under control.
The week you win is the target score you set is your baseline.