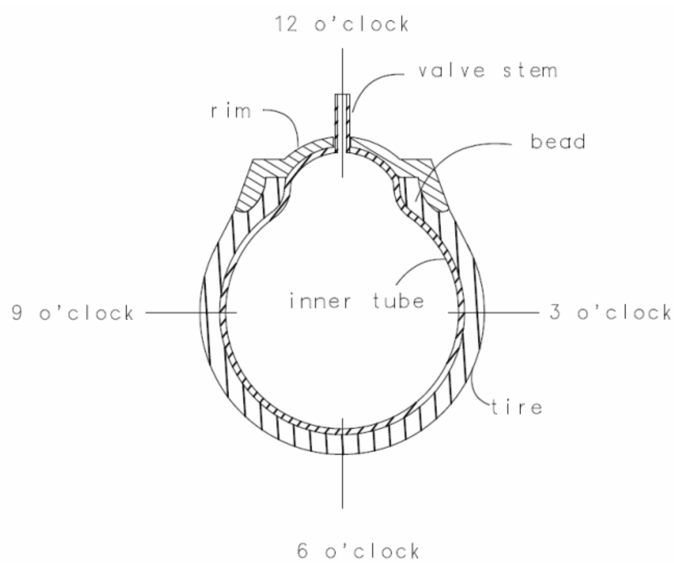
TUBE SADDLE® *Tech Tips*

Flat Tire Forensics 101: Part 3

Tech Tips is a free publication intended to provide useful information to all riders and racers. We encourage you to pass it along to all your riding buddies. In this first *Tech Tips* edition we deal with all aspects of the dreaded flat tire, how to diagnose them and how to avoid them. In Part 1 we covered the "Pinch Flat" and "Puncture Flat". In Part 2 we will covered the "Rim Lock Failure Flat – Valve Stem Tear" and in Part 3 we will cover the "Installation Failure Flat" and "Friction and Heat Flat."

How to avoid the "Installation Failure" flat and how to identify and prevent "Friction and Heat" flats

Lets first review the tire-inner tube-rim assembly in cross section as we did in Part 1. The figure above (or to the left) shows a dial clock interposed over the tire-inner tube-rim assembly. The 12 o'clock position is the valve stem, the 6 o'clock position is the bottom of the tire (knobbies not shown), and the 3 o'clock and 9 o'clock positions are the sidewall positions of the tire. In the articles below, we will refer to a particular position within the assembly by its "o'clock" position.



The "Installation Failure" Flat

The most common installation failure flat is to pinch the inner tube with your tire irons. With Tube Saddle® foam tire flap, it is practically impossible to pinch the inner tube with your tire irons. Nonetheless, the TireMounting Tool (check it out at www.tiremounting tool.com) or the Baja No-pinch tool are excellent replacements to using tire irons. On the right is the TireMounting Tool.

A less common installation failure has to do with breaking the final bead pull of the tire. This occurs when pulling the final bead onto the rim and not keeping the bead down in the center of the rim. You can use the Motion Pro® Bead Buddy™, but you can also keep the bead down with tire irons. Some riders use C-clamps or vice grips. Tube Saddle® is in the process of developing its own tire clip which you can see being used in our YouTube installation video (search term at YouTube: Tube Saddle install). On the left is a picture of the tire clip.

Finally, another installation failure has to do with dropping something inside the tire during the install, or failing to check that something was already in the tire during the tire install. I have seen flats where cup washers and nuts were inside the tire. On the trail, sometimes small rocks get into the tire when fixing a flat, resulting in another failure. Always double check that you have not dropped something in the tire during a tire change, particularly when out on the trail when you are in less than optimal conditions.

We were supporting two riders at the Glen Helen six hour race some years back with Tube Saddle®. Two hours into the race, they got a rear flat tire. After swapping the wheel assembly, we started breaking down the flat tire. To my surprise, I found "ding" marks all over the Tube Saddle® and the inner tube. The rim had two broken spokes with one missing. I went into the tire, and above is what I found inside the tire. If you look carefully, you will see a bent spoke and a spoke nipple sitting on the sprocket. This is what I fished out of the tire. It's just not possible for a spoke nipple to completely unscrew from a spoke and for the spoke to get pulled into the tire, particularly with the spoke rubber band intact, which it was. I never said it to them, but the only way the spoke and nipple could have wound up inside the tire was during installation. This is probably the strangest flat tire I have ever diagnosed.

“Friction and Heat” Flats

The friction and heat flat is the most misunderstood flat of all. This is a flat that typically occurs when running too low a tire pressure for a particular application. SCORE Baja racers are well acquainted with this, but not so much woods riders. As such, this type of flat is often mistaken as a pinch flat, when it really is not.

The best way to discuss this type of flat is to discuss the issues in racing SCORE Baja races, where speeds of 85 to 100 mph are maintained for extensive periods of time. At these speeds, if the sidewall of the tire is flexing substantially, a huge amount of heat is generated in the tire. Rubber starts to melt at about 350° F, and you would be surprised how easy it is to reach this temperature in a tire. Mousse bibs and Tire Balls are known to disintegrate and melt in these conditions. The lower the tire pressure, the greater the flexing, and the hotter the tire will get. This heat coupled with friction between the inner tube and the tire, starts to break down both the tire and the inner tube. The inner tube is rubbed and scuffed, creating stress concentration points all over the tube, typically between the 2 o’clock and 5 o’clock position, and the 7 o’clock and 10 o’clock position. Under heat generated by flexing, these stress concentration points give way resulting in inner tube failure.

The pictures above illustrate the rubbing and scuffing and stress concentrations that occur in an inner tube. The top two pictures illustrate the scuffing or scabbing that has occurred, which is part of the tire carcass vulcanizing itself to the inner tube, due to heat and friction. Most of the scabbing was already removed before these pictures were taken! The lower picture illustrates diagonal cut marks into the inner tube, due to heat and friction and the nylon chords of the tire separating from the carcass. All this occurs between the 2 o'clock – 5 o'clock position, and 7 o'clock – 10 o'clock position. It is these diagonal cut marks that significantly weaken the inner tube, and under heat and mild flexing the inner tube can fail as a pinhole leak or tear. When it is a tear, riders confuse this as a pinch flat when it is not.

The pictures above are from an IRC extra heavy duty tube in a Dunlop AT81 tire set at 8 psi with Tube Saddle® tire flap installed. The damage occurred between the 3 o'clock -5 o'clock positions as Tube Saddle® provided some protection. The rider did mostly single track riding for about 500 miles in Colorado, and at 8 psi this is fine. However, under the same tire pressure, he later did a ride where he did about 85 mph for about 14 miles. The inner tube began to vulcanize itself to the tire. Although he did not get a flat, you can see what bad shape the inner tube is in. If your inner tube looks anything like this, throw it away and put in a new inner tube. Also, this illustrates why it is still advisable to run heavy duty inner tubes, for if this was a standard duty inner tube, he would have got the "friction and heat" flat for sure.

Pictured on the right is a cheap thin walled front inner tube that was used in a dual sport ride in Utah in the summer. The rider had it set at 8 psi running Tube Saddle®. At the end of the 4 day ride, the rider chose to ride back on the pavement to his van about 400 miles away. He was running 8 psi, riding about 65 mph on asphalt in 100+ degree weather. Obviously the pavement was much hotter. The tire got so hot from the pavement, the low pressure, and the speed that he got a slow leak. Once he realized he had a flat, he stopped to fix it but could not touch the tire over 45 minutes. The knobbies were melted. The pinhole leak was directly at the 6 o'clock position on the inner tube. There was no thorn or any sign of a puncture. This was a heat failure where the inner tube simply started to reach its melting point and just gave way. In short, stay away from cheap thin walled inner tubes especially when you might be doing any high speed or high heat related riding.

Here is another example of what high speed riding on pavement can do. This was Tube Saddle creator James Curry's rear tire run in the 2004 Baja 1000. The Bridgestone GRITTY – ED78 is a very stiff ply tire meant for desert racing, but it is not a DOT tire and not meant for highway use. James ran this brand new tire with an ultra heavy-duty inner tube at 19 psi on a Honda XR650. James section was about 200 high-speed miles with about 20 miles of pavement at the beginning and about 12 miles at the end. The pavement section was supposed to be regulated at 65 mph and is why James went with this tire instead of a DOT tire, not planning to exceed the speed limit. Unfortunately, it turned into 100mph race on the pavement sections. The above pictures are what were left of that tire in just 200 miles. James should have had a DOT tire, and he was very lucky it did not blow out. The lesson learned is that tire selection in high-speed applications is extremely important.

OK, getting back to inspecting your inner tube. The picture on the right is a used inner tube that is still good. As you can see, the scuffing is rather minimal, and although there is the appearance of wide diagonal lines present, they are not cut marks, but merely a slight imprint from the inside carcass of the tire. Since this is a heavy-duty inner tube, it is still good.

It is the breakdown of the tire itself that contributes most significantly to the friction and heat flat. In the picture below, you can see the nylon chords of the tire in the sidewall have separated from the carcass of the tire. This is what cause the diagonal cut lines in the inner tube above. This typically happens when a tire has been used way past its life and is amplified if run at low tire pressures for long periods of time. It also happens when the sidewall of the tire gets too hot. To

inspect, just run your hand inside the sidewall and you can feel if the chords have separated at the 3 and 9 o'clock positions. <u>If you got a flat and you see or feel nylon chords separated in the tire, the tire is done and you should replace it and the inner tube as well</u>. If you are out on the trail and cannot replace the tire right away, cut the raised chords with a knife to minimize the chance of just getting another flat with a new inner tube. We have all experienced someone who just continues to get flats with the same tire with no indication of a puncture. Often it is because the chords are separated, and every time the tube is replaced the chords cut the tube again, leading to another flat.

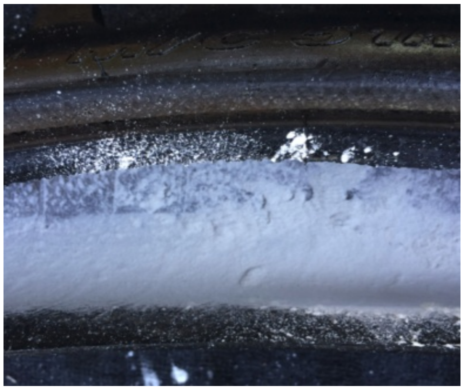
So, how do you avoid the friction and heat flat tire? First, select reasonable tire pressures for the type of riding you do. For single-track riding, 8-12psi is reasonable. For hare scrambles, motocross, etc… 10-14psi is reasonable. For SCORE Baja type riding, 14psi and above is reasonable. Also, what is a reasonable tire pressure also depends on your weight, your riding skill, but also your tires. Stiff ply tires can run at lower tire pressure than soft ply tires.

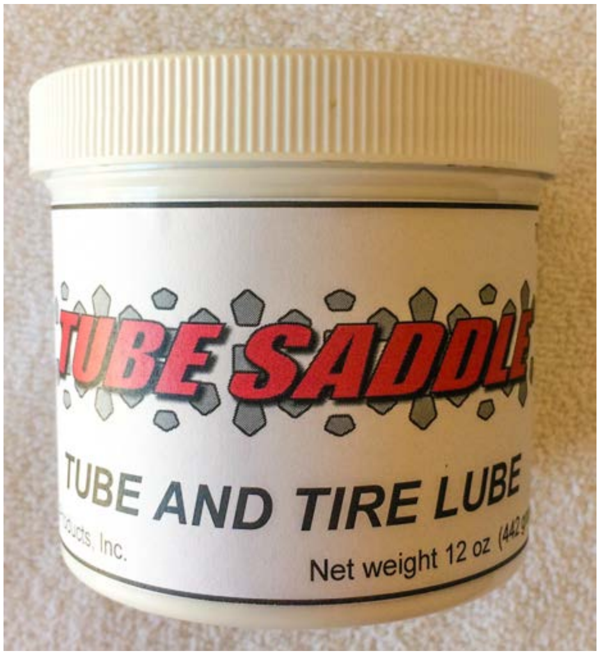
Second, always carefully inspect your inner tube and tire for signs of wear signaling replacement as discussed above. Also, always run at minimum a heavy-duty inner tube in high-speed applications.

Third, and probably most important, always provide lubrication between the inner tube and the tire. Talc powder (baby powder) is good, but has difficulty keeping the sidewall of the tire lubricated. Others prefer tire soap that can be purchased at your Auto Store. I have used this in conjunction with Talc powder.

For SCORE Baja, one prominent National Enduro champion suggests pouring about a half cup of WD40 into the tire and running an ultra heavy duty inner tube. Although messy, it tends to work. Just try not to get the WD40 on the bead of the tire that sits against the rim.

Tube Saddle® has been developing a lubrication system that is essentially a cream or paste that you spread into the sidewall of the tire. Then you add your talc powder into the tire and agitate the tire to allow it to stick to the paste. What you end up with is a dry lubricant that impregnates and adheres to the pours of the tire right where you need it: between the 2 o'clock – 5 o'clock position and 7 o'clock – 10 o'clock position. The pictures below provide a demonstration, and we hope to have this product on the market soon.





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www.tubesaddle.com


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