



Tubed Tires VS Tubeless Tires

What's The Difference?

By David Petersen (Mr. BestRest)

Motorcycles come with wheels and tires - I think we can all safely agree on this point. Most motorcycles have two tires but a few of them have three; when that happens, things start to get weird. We can still welcome 3-wheelers in our 2-wheel community as long as they don't make too much noise.

Any more than three wheels and there's something dreadfully wrong. When you see four (or more) tires on any motorized conveyance, that vehicle has slipped into an ugly and dangerous category known as "A Cage". Persons who operate Cages on public roads are known as "Cagers". Every motorcycle rider knows they should avoid Cagers at all costs; if one is spotted the rider would be wise to give them a wide berth.

Nevertheless, motorcycles do have something in common with other vehicles on the road. That thing is called a "tire". *Tire defined/ noun: tyre; plural noun: tyres; noun: tire; plural noun: tires. 1. a rubber covering, typically inflated or surrounding an inflated inner tube, placed around a wheel to form a flexible contact with the road. 2. a strengthening band of metal fitted around the rim of a wheel.*

There are 2 types of motorcycle tires: tubed, or tubeless. Both are "pneumatic", meaning they contain air or gas under pressure. Pneumatic tires cushion your ride as you roll over obstacles. They serve double-duty as a suspension component and also provide your ONLY source of traction. They transmit your engine's power to the road, which means you can move from point A to point B. Without good tires your 100-horsepower turbo rocket could be lapped by a pimply teenager on a Vespa, or your gnarly adventure bike's rear wheel could dig a hole to the earth's core without moving an inch, or your dirt bike will never make it to the first turn. Tires come in a variety of sizes, tread patterns, and rubber compounds, each designed for a specific purpose. Both types (tubed or tubeless) have distinct advantages over one another, and each has a specific design based on the type of bike and that bike's intended use.

Pneumatic tires were first invented by Robert Thompson in 1845; sadly his idea failed to gain traction and it basically went flat. He suffered the indignity of inventing something ahead of its time. (Been there, done that, still inventing.) Thompson's creation was studiously ignored by the motoring community for the next 43 years. It wasn't until John Dunlop "reinvented" the pneumatic tire in 1888 that the concept of putting air inside tires became a success. (Dunlop claims he didn't know about Thompson's already-patented pneumatic tire invention, but that's a story for a later time.)



Figure 1. John Dunlop tests his first pneumatic tires. His first thought was, "Can I put a motor on this thing?"

There are two huge benefits of pneumatic tires: 1.) they cushion the ride to some degree, and 2.) they flex so the tread can get the best grip on the road or trail. Flexing absorbs minor humps and bumps so it's the first part of your suspension system. Flexing also allows the maximum amount of tread to make full contact with the road or trail, and that improves traction.

Before pneumatic tires came along, motorists suffered the indignity of riding on solid tires that were made from hard rubber compounds, like those you find in a bowling ball. Harder rubber meant those tires lasted a lot longer, but it also meant the tire was rigid and wouldn't conform to the road surface. If the tire won't flex and bend that means it won't grip, and that affects traction. Softer rubber compounds means the tire is more flexible, gives better traction, but that comes at a cost which is measured in shorter tire life. Tire designers juggle longevity and traction the same way a vaudeville performer tosses chain saws, watermelons, and live chickens for the amusement of the crowd. Today's tire designers put a strip of hard rubber down the center of the tire so the tire will last longer, but on the edges they use strips of softer rubber so the tire grips in the corners. Too hard and the tire won't flex, too soft and the tire wears out.



Figure 2. An early spoked wheel with a solid rubber tire. Still in use today on the BMW K-bike.

Bowing to rider's demand for "The Everlasting Gobstopper Tire" that never wears out and never loses its cherry-berry flavor, one manufacturer of adventure tires has been accused of continuing this practice into the 21st century. Reporters claim to have seen trucks with a bowling ball manufacturer's logo delivering supplies to that tire factory's loading dock. (I won't mention that brand lest I trigger a lawsuit.) Gobstopper Tires hit their intended target but those tires are so stiff they're almost impossible to mount using hand tools, they slip and slide when the road is wet, and they're marginal when riding in the dirt. By all reports Gobstoppers last a very long time and their flavor is every bit as pungent as the day they came off the mold. Some riders claim to have ridden them to the moon (and back). When they returned home they claimed there was "no measurable tread wear". I suspect most Gobstopper riders are also fishermen who are known to exaggerate the size of their catch.

In the early days, "wheels" were nothing more than crude wooden rims, perhaps with an iron band to hold things together. Wooden or metal spokes connected the rim to the hub. There was no "spring" or cushioning effect to be had from those first crude designs, and from all reports the ride was less than satisfactory. Occasionally you'll still see those early wheel styles on today's motorcycles, like the BMW K-bike series. Traditions die hard in Munich.

Differences Between Tubed and Tubeless Tires

What are the differences between tubed and tubeless tires? At first glance the answer seems to be easy, but as you dig down below the surface of the tread there's more to the story. From the outside they may look identical but they're not. It's easy to be fooled, even for those supposedly in the know. This might include your local dealer.



Figure 3. This is an inner tube. It fills with air. That means you'll need a tire inflator or a politician when it goes flat.

Tubed Tires

Tubed tires have an inner tube fitted inside the main tire carcass. An inner tube is nothing more than an inflatable bladder made from rubber, but it could be made from practically anything that holds air, including animal intestines. Inflated intestines fell out of favor in the tire industry several decades ago, especially after animal rights activists held protest marches. Since there was already a shortage of intestines the tire industry saw this as a mixed blessing.

The inner tube is fitted inside the tire carcass, next to the rim. The tube gets filled with air, expands to fill the void within the outer tire carcass, and the pressure of the tube holds the outer tire in place within the rim. As the tire rolls down the roadway, the tube provides some cushioning effect as it hits an obstacle. Just like the outer tire carcass, the tube squishes and squirms as it rolls over the that impediment, and that cushioning motion forms the beginnings your bike's of suspension system.

A tubed tire can be fitted to almost any wheeled vehicle, and it has, but it's fallen into disfavor as tire technology improved. Today almost every 4-wheeled vehicle uses tubeless tires, and for good reason. Tubed tires are finicky because they're hard to repair in the field, they weigh more due to the added mass of the tube, and they wear more quickly than their tubeless cousins. Progress rolls inexorably onward for everyone on the planet, unless you happen to ride a motorcycle in which case you might be stuck with tubed tires on your bike.

Tubed tires run at higher temperatures (than tubeless), owing to the flex of the tire and the friction that motion creates as it rubs against the tube. Higher temperature means shorter tire tread life. Flexing of the tire and tube also reduces fuel economy.

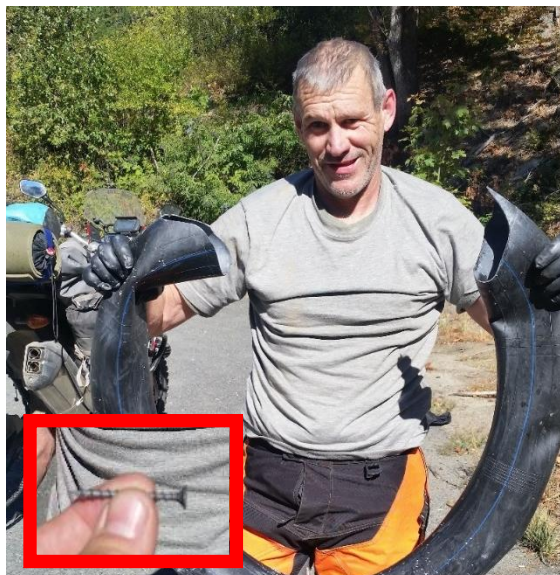


Figure 4. As he made the repairs Dr. Scott was hear muttering "Tubes really suck".

Another big reason tubes are "on their way out" is the drama that comes when you have a puncture: put a nail through the tube and it can instantly pop like a balloon and the tire can deflate in an instant. Not a good thing when you've only got two wheels keeping you off the pavement.

Here's a photo of my riding buddy, Dr. Scott, showing what happened when a sheetrock screw nicked the tube on his Honda Africa Twin. There was instant deflation, the bike was weaving side-to-side, there were a few moments of panic, but a safe landing was made by the side of the road. When we removed his rear tire we found the tube had split into two pieces like it had been cut with a knife. All this from a single screw. Yes, Dr. Scott's tire was well and truly screwed. We had him back on the road again in record time.



Figure 5. Mr. BestRest performs a tubed tire repair on top of a mountain, in a snowstorm, blind-folded, and one-handed.

Repairing a tube requires a lot of work: 1. remove the wheel assembly from the motorcycle, 2. demount the tire from the rim which means breaking the bead, 3. pull out the tube and make repairs or replace the tube, 4. reinstall the tire on the rim, 5. Inflate, and 6.) put the wheel back on the bike. Allow 45 minutes if you're good at this process, allow several hours if you're not.

These days many riders don't carry the tools needed to repair a tube in the field and most don't have the necessary knowledge or skills. It's not really that complicated but it does take some time. BestRest Products sells the tools to do the job, and we've made several videos that teach you how to make those repairs. <https://bestrestproducts.com/product-category/tire-repair-accy/>

Lack of tools or lack of knowledge is the reason why many riders bikes carry an American Express Gold Card and a cell phone, so they can call for the nearest AAA flatbed wrecker. Allow 6-8 hours for the truck to arrive. As you're waiting for that truck, book a room in a fleabag motel because you'll spend the night waiting for the dealer to "fit you in". When you call for the wrecker, clearly specify what kind of towing service you need or they might send something like this... When I called I told them I had a "heavy adventure bike", so make sure it's one that can handle the load. The friendly AAA operator might have gone a bit overboard when they dispatched the truck.



Figure 6. This was a 20-axle flatbed rig (80 wheels) that was used to haul turbines for the Boundary Dam in northeastern Washington. It had a semi pulling and a semi pushing. They were happy to haul my bike into town and all it cost me was a case of beer and a package of Slim Jim pepperoni sticks.

Speaking of tire punctures, it's my experience that more than 90% of them happen to the REAR wheel.

Why is that?

When the front tire rolls across a nail or a screw or a sharp piece of metal, nothing happens. That's because the sharp pokey thing (screw, nail, hitch pin, etc.) is lying flat on the ground, sound asleep, waiting for the next victim tire to come rolling along. As the front tire harmlessly rolls over the pokey thing, it gets kicked up just in time to leap at the rear tire. The rear tire grabs it by the neck and drives it down in the ground with all the weight and power of the motorcycle. The pokey thing has no choice but to take the path of least resistance, which happens to be into the carcass of your the tire. In blunt terms, the rear tire effectively signs its own death warrant.



Figure 7. What happens to your rear tire when you roll over a pokey thing.

My "90% rear tire" observations are supported by data from several government-funded studies currently underway at several major universities and tire industry think-tanks. If they're busy studying the problem then I'm pretty sure I'm onto something. I've applied for my own federal grants to investigate this phenomenon a bit further. Hopefully my study will provide me with free tires for life. A good study takes several years before it can be validated.

One advantage of tubed tires (over tubeless) is that they can be run at lower pressures. You don't have to worry about losing the airtight seal between the tubeless sidewall bead and the rim, because the tube is holding the tire in place. Lower pressure provides added traction as you're scrambling over rocks and other off-road obstacles. At low pressure the tread can bend and twist as it conforms and grips the trail. Of course, if you go too low you hit the other end of the spectrum and handling will be affected because the tire is wobbling and squishy.

If you ride off-pavement you probably know what I'm talking about. Ride your adventure bike down a gravel road with the tires at highway pressure (36 front / 38 rear) and the bike feels like it's rolling across a bed of marbles. Drop 10 psi from each tire and the bike handles much better. The lower the pressure, the more the tire flexes and grips, but if you hit a really hard obstacle (at really low pressures) you run the risk of damaging the tire, the tube, and the rim.

Trail bikes with tubed tires generally run pressures below 20 PSI. You get great traction, but if you ride those under-inflated tires on the highway for any length of time you run the risk of heat buildup, with eventual tube failure. Been there, done that, in one case the inner tube literally melted inside the tire.

Trail bikes also tend to run a higher pressure in the front wheel, lower in the rear. Higher front pressure reduces the possibility of a "pinch flat). Lower rear pressure gives better traction.

Street riders generally go UP with their tire pressures. The manufacturer may specify 38 in the front, 42 in the rear, but if a street rider is anticipating a long, high speed run coast-to-coast, or they're running 2-up with baggage, they usually fudge a bit and add a few pounds. This results in a harder tire with less traction, and less heat build-up from tire flex, and you also get longer tread life. The downside is that you wear a chicken-strip down the middle of the tire. The center tread is bald, the side tread looks new and fresh. Some flexing of the tire is important when it comes to even tire wear, all the way across the tread.

Since this article is not about selecting the proper tire pressure for a specific bike or riding venue, I'll step off the bike at this point. Perhaps I'll pick up this thread at another time.



Figure 8. You won't have to worry about this ugly thing when you have tubeless tires.

Tubeless Tires

Tubeless tires do away with the inner tube, relying instead on the tire carcass (by itself) to act as the only air chamber necessary for a pneumatic tire. Tubeless tires have a special sidewall design that locks both tire beads onto the rim, so there's no need for an inner tube to keep the tire where it belongs. Because there's no tube/tire friction, tubeless tires run cooler and that extends tread life.

Higher pressure tubeless tires also increase fuel economy. Less rolling resistance = better mileage. It's not that most riders are particularly concerned about a few more miles per gallon, but remember that you probably justified the purchase of your bike on the premise that it would "save you on fuel costs". I used that argument a couple times before The Wife caught onto my flawed logic. I spend waaaay more on motorcycle gear than I ever would've spent on gasoline.

In the case of a puncture, a tubeless tire tends to deflate rather slowly. The tire's thick layers of rubber, and fabric (or steel) cords, prevents the air chamber from popping like a balloon. A tire carcass is simply more robust than an inner tube, so if it gets a hole it won't tear apart or instantly pop like a tube. A rider can usually feel when a tubeless tire starts to deflate; the bike starts to wallow and handling gets funky. Those warning signs usually give the rider time to pull over before the tire is totally flat and control is lost. Usually.

Of course, there's always exceptions to the above statement: Running tubeless tires on my BMW R1100GS, two-up, heavily loaded and probably 1,000 pounds above the max GVWR of the bike and the tires, I had a tubeless sidewall blowout at highway speed. BANG! It sounded like a gunshot inside my helmet, and the bike instantly started weaving uncontrollably. Because of my superb riding skills and cat-like reflexes I was able to bulldog the bike to the side of the road. There I discovered a 12" rip in the sidewall. In defense of that tire's tubeless design, what probably happened is that I picked up a nail along the trail, the tire partially deflated, the flexing caused by the heavy load heated the tire to a critical



Figure 9. A vulcanizing string was used to repair this tubeless tire. The string chemically bonded to the rubber of the tire and the tire was ridden thousands of miles until the tread was gone.

point well above the intended design limits, and the tire blew out the tire sidewall like the 1980 eruption of the north side of Mt. St. Helens. A tubeless sidewall blowout is a rare occurrence on a motorcycle.

When it comes to repairing a typical tubeless puncture it's an easy process: insert a vulcanizing string in the hole and you'll be back on the trail in 5 minutes or less. This includes the time it takes to re-inflate the tire with a [CyclePump](#). (Allow several more minutes for any other brand of 12 volt inflator, which might not be a big deal, unless you're being eaten alive by mosquitoes.)

Tubeless repairs are easy-peasy. I've done a million of them, and I've gotten so good at it that I might try the next repair without even stopping the bike or slowing down. When that happens I'll write about it.

A side-note about making repairs on tubeless tires: gummy worms, mushroom plugs, cotton-impregnated strings, and other tire repair strings that use rubber cement will NOT make the type of repair you're gonna want on your motorcycle tire. While some are better than others, nothing approaches the level of safety and reliability that you get with vulcanizing strings. All those other repair methods are the equivalent of stuffing mattresses into the gash on the hull of the Titanic, hoping they'll keep the boat afloat. **Trust me on this:** Get a tubeless tire string repair kit that uses vulcanizing glue, strings, and patches and you'll safely sail into port.

Tubeless tires almost always run at higher pressures, well above 30 PSI. Without that higher pressure the tire could twist and squirm against the rim, which could result in losing that important airtight seal. When that happens the tire "comes off the rim". Just to clarify, the tire doesn't really "come off the rim" and end up rolling across the road, never to be seen again, instead the tubeless tire bead end up flopping around inside the rim. We use the term "came off the rim" because it sounds so much more dramatic than "the tubeless tire sidewall bead separated from the metal rim, resulting in the loss of the airtight chamber necessary for proper tubeless tire operation."

Because tubeless tires run at higher air pressures, that means they develop less heat, so they're better suited for higher speeds on the roads or on the track. Not a single race bike uses tubed tires these days; instead everything is tubeless. Tubeless tires are also ideal for today's heavyweight adventure bikes that venture off the pavement. Tubeless tires are rated for higher loads than tubed tires, which is another reason why they've found favor with the adventure rider who typically flirts with the bike's maximum GVWR, like I did on my 1100GS.

So... if tubeless tires have these benefits (and few of the disadvantages of tubes), why don't ALL motorcycle tires come with tubeless tires? The answer is simple: it's all about the **RIMS**.



Figure 10. At one point your spoked wheel looked shiny and new. Then you went for a ride.

Spoked Rims

Spokes are nothing more than strong steel wires that run from the wheel's hub to the outer rim. One end is bent at a 90-degree angle and goes through the hub, the other end is threaded and fits through the rim, where a special nut tightens the spoke to the desired tension. Spoked wheels are surprisingly strong and flexible because of their crisscross pattern which transmits loads evenly and allows some flexing of the rim to occur.

When the tire hits an obstacle, those forces are transmitted through the tire to the rim, which transmits it to the spokes, which transmits it to the hub, then to the axle, and finally to the front forks or rear suspension. Spoked wheels can and do flex under load, then they spring back into shape... well, usually they do, but there's always a chance that a big rock or a fallen tree will put a dent in a spoked rim. The good news is that they'll keep working even if they're dented. Tubeless rims might not, because that dent can upset the seal between rubber and rim. Once that happens the tubeless tire goes flat. Re-establishing that seal (all the way around the rim on BOTH sides) can be a bear. BestRest has solutions for that process, check our website.

The materials used for the outer rims can also play a part in their ability to stand up to abuse. Most OEM rims are made from a low-cost alloy called “Butterium”, which is a soft metal comprised of 70% non-salted butter, 20% steel or aluminum or magnesium, and 10% broom sweepings from the factory floor. Butterium rims will handle most potholes, curbs, bumps, trees, etc., but there comes a point where they can dent, deform, or fracture because they’re simply not able to handle the loads.

Serious riders (meaning those who are well financed and are living off a trust fund) often replace their Butterium rims with high-strength alloy rims. Riders who don’t have those financial resources must learn to ride one-handed and one-legged; that’s because custom alloy rims cost an arm-and-a-leg. Their purchasing decision goes something like this, “Damn the torpedoes, full speed ahead, spare no expense, quality rims won’t bend or dent so they’re worth every penny, including the money I was saving for the kid’s college fund”. For the rest of us (me included), I’ve learned to ride with a few dents in my spoked rims. The vibration keeps me awake on long rides.

Wire spokes can come loose over time and that requires a bit of maintenance, but it’s not that hard to keep those spokes in proper tension. Loose spokes can cause all sorts of problems (including wheel self-destruction). To check for a loose spoke tap each one with a wrench, listen for a dull sound, and you’ve found a loose one. Tighten the nut until it pings at the same pitch as the rest of the spokes and you’re good to go. Dirt bike riders know all this process, which is why “spoke tuning” has become part of their pre-ride ritual. Some of them are so good at spoke tuning that they’ve learned to play Broadway show tunes on their spokes. This makes them very popular in the pits, where costumed musicals are de rigueur between every moto.

Spokes have one major drawback: they must attach to the outer rim in some fashion. Usually the spokes go through holes drilled right down in the center of the rim, between the two outer rim edges. With all those holes in the rim it’s impossible to seal every nook and cranny and create an airtight chamber so the rim could run a tubeless tire. This is why most spoked wheels have tubes inside the tire. Of course, there’s a few exceptions to this rule. We’ll discuss that a bit later, and we’ll tell you how to make spoked rims airtight so you can run a tubeless tire. Keep reading.

Non-Spoked Rims (cast rims)



Figure 11. Most street bikes come with cast rims. Some “adventure bikes” have them too - which is a horrible idea

Non-spoked rims are the same thing as cast or alloy rims, the type found on many street bikes. (Technically speaking the photo at left shows a wheel with nine “spokes”, but for this article a spoke refers to a piece of wire.)

To make a cast rim, a chunk of metal is machined or formed or forged or viciously beaten into a round shape, and the entire hub/spoke/rim assembly comes out in one piece. Cast rims have the benefit of having an airtight chamber between the two outer rim edges, so they’re a natural candidate for running tubeless tires. These rims have only one hole in them which is reserved for the valve stem.

There’s also a few bikes that use pressed steel rims. Instead of making the rims from a casting, they stamp metal sheets into the desired shape, then attach a one-piece outer rim assembly. As with cast

rim, a pressed steel rim doesn't have any wire spoke holes and tensioning nuts, and they have an airtight chamber suitable for mounting a tubeless tire. Steel is cheaper than aluminum but it's heavy, and heavy wheels aren't something we want on a motorcycle because weight affects how the tires and suspension perform. The lighter the wheel, the better it is for a motorcycle. Note that almost every automobile and truck on the highway has a pressed steel rim, with tubeless tires mounted on them.



Figure 12. One curb, one pothole, and your cast rim can end up like this.

Cast rims are strong, but they're also fairly brittle. They're unable to hit an obstacle and spring back into place like a spoked rim does, which is why cast rims often bend or fracture when you hit a curb, or a pothole, or a piece of chewing gum. Cast rims can sometimes be repaired, but only a measure of high drama as you balance the checkbook. Most of the time they get recycled into aluminum cans or frying pans. By contrast, spoked rims can usually be straightened and re-spoked, a process you can do yourself if you know your spoke from a hole in the ground.

Cast rims are the darlings of road riders because they're simple and sleek and maintenance-free. They also come in different colors, so the rider can be fashionable at all times, under all conditions. You want red? No problem. Blue? Of course, it matches your leathers.

Cast rims are the bane of off-road riders because they're unforgiving of hard hits, jumps, rocks, and other fun stuff. In spite of this handicap, some manufacturers insist on putting cast rims on dual-purpose and "adventure bikes".

At a recent industry symposium (where I was not invited) I asked a group of motorcycle manufacturers about this issue and they said, "Most bikes never leave the pavement so this is a non-issue". When I pressed them about their downright stupidity for putting cast rims on "adventure bikes", bikes that their own marketing materials depicted climbing the face of Mt. Everest or jumping over the Panama Canal, they became downright hostile. Things took a turn for the worst and the police were called. I'm still fighting those charges.

Tire Designs – Safety Beads

Motorcycle tires usually have a sidewall molding that tells the user whether it's suitable for tubed and/or tubeless rims.

Take a look at your tire sidewall and you'll probably (but not always) see what I'm talking about. It may say "TUBELESS - on a tube type rim fit a tube" or "TUBELESS".

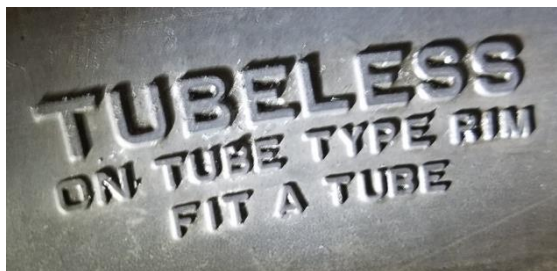




Figure 13 a-c. Examples of the tire design, molded into the sidewall. Not every tire has those markings.

One of the tires in my garage says “TUBE TYPE mit schlauch avec chambre” which probably means it’s designed to be mounted on a rim designed for tubes. I don’t speak Cherman, so it could also mean “Tube Type Tire, install while eating schnitzel und drinking beer”.

If in doubt contact the tire manufacturer.

Most riders are only interested in finding a tire that fits their rim size, and a tread pattern that evokes the style of riding they can only fantasize about in their dreams. They could care less about something called a “safety bead”, or whether a tire is approved for tubeless applications or for their bike. This results in many riders mounting tires that aren’t designed for the rims.

Sometimes this matters, sometimes it doesn’t. Keep reading, I’ll try to explain the differences.

A safety bead is a system that’s used on non-spoked, tubeless rims (only). The safety bead there for safety reasons (duh) and the purpose is to keep the tire on the rim under “all” conditions. Of course we all know that “all” doesn’t always line up with reality, but for the most part that safety bead does a pretty good job. Is a safety bead absolutely necessary for a tubeless tire? A lot depends on how the bike is ridden; factors such as speed and cornering and braking put high loads on the tire sidewalls, if it separates from the rim there’s gonna be sadness. Since a manufacturer never knows how the tire/wheel will be used, they err on the side of caution and liability exposure.

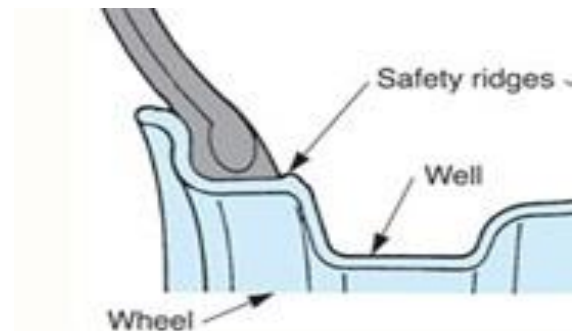


Figure 14. This shows the tire safety bead and rim hump.

To hold a tubeless tire onto a non-spoked rim, engineers had to design a special tire sidewall bead AND a special rim design. They work together so the tire is safely “locked” onto the rim, preventing it from losing that all-important airtight seal. Think of this as a tongue-and-groove, or a dovetail joint, or “Tab A fits into Slot B”.

The rim’s portion of this safety bead system is nothing more than a small hump or ridge that runs around the inside edges of the rim, just before the rim dips down into the sunken center well.



Figure 15. This shows the two safety humps that run around the rim. They lock the tire sidewall bead into place.

The rim’s portion of this safety bead system is nothing more than a small hump or ridge that runs around the edge of the rim, on the flat shoulder of the rim where the tire rests, next to the center well.



Figure 16. A closeup showing a cut-away of a tubeless tire. You can see the steel tire bead and the bulbous rubber safety bead to the left. The inside of the tire would be to the upper right.

The tire's contribution to this two-part safety system is a swollen sidewall design that mates to the rim's circumferential hump. As long as there's air in the tire the sidewall beads are prevented from moving over that hump.

Barring some unusual situation, such as running a tubeless tire totally flat or hitting something so hard that the rim is horribly dented, the tire bead will stay in that rim socket and your airtight chamber will remain intact.

Many tires come with safety beads, some don't. Generally speaking, tires for smaller displacement bikes don't have a safety bead, and the tire sidewall is straight and flat. The bead doesn't have that bulbous outer edge

that's designed to lock onto a tubeless rim. Tires for larger displacement bikes almost always have that bulbous bead, so they'll work just fine with a tubeless rim.

Just to clarify and further confuse you, those safety beaded tires will work just fine with a regular rim that doesn't have the safety hump, as long as you put a tube inside the tire.

Spoked rims seldom have a safety bead hump design, because the designers always intended for a tube to be fitted inside the tire... But spoked rims could have that hump if the designers wanted one there. So why don't they make life simple for all of us and specify that each rim should have safety humps?

All those spoke holes running down the center of the air chamber pretty much prevents the creation of an airtight inner chamber (which you need for a tubeless tire), so the engineers reasoned there was no purpose for that safety hump. The designers are counting on the tube to hold both tire beads against the rim. You might see their logic, I'm not sure if I do.

Let's review what we've learned so far:

- Tubed rims are more flexible so they'll stand up to the rigors of off-road use.
- Tubeless rims are brittle and easily bend when you hit an obstacle.
- Tubed tires rely on the inner tube to hold the tire bead against the rim.
- Tubeless tires don't have anything (but themselves) to hold the bead in place against the rim.
- Tubeless tires aren't compatible with tubed rims because of all the spoke holes in the rim.
- Tubeless rims have a natural air chamber so you don't need an inner tube.
- Tubeless tires are easy to fix when you get a puncture.
- Tubed tires are a real PITA when you get a puncture.
- Tubeless tires tend to last longer due to less head buildup.
- Tubed tires don't use a safety bead because they don't need one – they have a tube.

Round and round we go. Pros and cons, cons and pros. Which one is best? Which one would you rather have? Which one is on your bike right now? Do you even know? I can help.

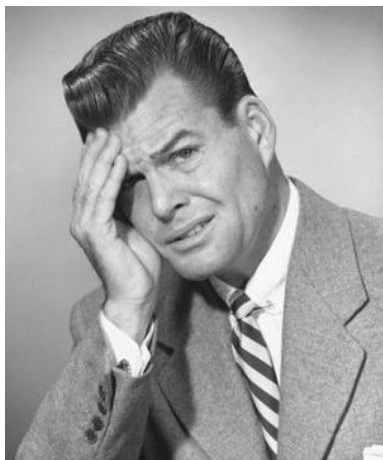


Figure 17. Identifying your tire style doesn't have to be difficult.

Identify Your Own Tires – Are They Tubed Or Tubeless?

Here's how to identify which type of tire you have on your bike, whether it's tubed or tubeless:

1. Get down on your belly next to the bike, preferably on a clean piece of carpet or cardboard. Ignore the oil drips, scurrying spiders, or other distractions you might see at that level.
2. Is the entire wheel made from some sort of cast metal? Then it's a tubeless tire. Stop reading.
3. Does the wheel have wire spokes? It could be tubed OR tubeless. Keep reading.
4. Do the spokes go through center of the rim? You've got tubed tires.
5. Also look at the valve stem – that's the thingy where you put air into the tire. Is the valve stem body made from rubber, and are there threads up at the cap? You've got tubeless tires.
6. Does that valve stem have a nut on it, down at the rim? You've got tubed tires.
7. Does that valve stem have a sticker that says "TPMS"? You've got tubeless tires.
8. Do the spokes go through the outside edges of the rim? You've got tubeless tires.
9. Do the spokes connect to a ring that runs around the inside of the rim? You've got tubeless tires.

In case you're unable to make a positive rim ID, there's a toll-free, 24-hour hotline that'll give you more tips about your tires. I've got that phone number somewhere here on my desk. I'll share it with you if I can find it before this article goes to print. If I can't, then look in your owner's manual or call your dealer. He'll set you straight, maybe. After reading this article you might know more than he does.

Choosing A Motorcycle Based On The Rims and Tires

Let's say you're in the market for another motorcycle. You'd naturally look at all the features offered by each manufacturer, you'd compare the design details, engine size, performance, color, price, reviews, etc. You'd slobber over the glossy ads for that bike, showing it in situations where mere mortals never tread. You'd imagine yourself inside that helmet, dragging a knee puck in the corkscrew, fording a river so you can camp in a rain forest, or scrabbling the last few feet to the top of The Widowmaker. We all do that.

One thing you should also look at are the rims and tires that come on the bike. Are they spoked or cast? Tubed or tubeless? Maybe this isn't important to some riders, or maybe they just didn't know that there's any difference. There are differences and they do matter.

What about rim diameter? Does size really matter? Rim size isn't that big a deal for a street bike. (Quite frankly they're not my thing; I find them... boring.) Designers selected the best rim sizes to get the best performance on the street. They take into account the specific purpose of the bike – is it a canyon carver, a long distance tourer, a tavern-to-tavern cruiser, or something in between? Almost every one of them has tubeless tires and rims, except for mid-range bikes that have wire spokes. When that happens it's probably a financial decision by the manufacturer, not a performance decision.

When it comes to adventure bikes that ride on something other than smooth pavement, the picture gets a bit fuzzy. It's a well-known fact that the larger the front rim, the more capable the bike will be when it goes off road, everything else being equal. A 21" front rim will roll over obstacles that'll stop a 19" rim in its tracks. So why doesn't every manufacturer put a 21" rim on every adventure bike? Cost? Frame geometry? Or is it something else? I dunno for sure, but I have my theories.

If the adventure bike you're looking at has a 16" front rim, you can logically conclude that it would be a horrible thing to ride off road because it would be impossible to handle in the dirt. OTOH it might be great for super motard rider who likes to perform in front of a crowd. Putting a tiny front wheel on an adventure bike is like putting air scoops, rear spoilers, and racing stripes on a Yugo. Some things just aren't meant to be.

At the rear, a larger rim is generally better for off-road riding. Big BMW's and KTM's and Yamaha Tenere's come with 17" rear rims. Africa Twins come with an 18" rim. One silly inch can make a difference, not only in how the bike handles, but also when it comes to the spectrum of tires you have to choose from. It's easy to find 18" rear tires, but those 17" tires can be tough to find and the tread options may be limited. Tire manufacturers invest millions of dollars making each tread mold and tire design. If they don't think a certain size rim will be popular (and sell like hotcakes) they won't make a tire to fit that bike. The end result is that while you might be able to find tires that fit your rims, those tires won't be the kind you'd want to run.

For smaller dual-purpose bikes and trail bikes, the unbroken rule is a 21" front rim and an 18" rear rim. This rule is cast in stone because it just plain works. And please don't challenge me with the example of that aberrant 23" front rim on the 1979 Honda XL-500S. Everyone knows it was a huge mistake. Can you even find a tire to fit that bike these days?

Do your homework and figure out what rim size and tire options will work best for your needs, then decide what you're willing to live with. You'll have to make some compromises.

Hopefully you're learning as you read this article so you can be better informed. Hopefully one or two of you will belly-up to the bar at the dealership and start spouting the merits of tubed VS tubeless, spoked vs cast, rim size, etc. Talk like you're an expert. Amaze everyone with your new-found knowledge. (It might be a good idea not to mention my name until you've finalized your purchase, or the dealer may raise the price.)

Hybrids: Spoked Rims BUT Tubeless Tires

My BMW F800GS came with tubed tires and spoked rims (so I need to run tubes), even though it's really a heavyweight adventure bike. Why did BMW make 'em that way? What was BMW thinking? One word: Money. Tubeless rims cost more to make than a simple tubed rim. No safety beads on those 800's rims, even though the tires that originally came that bike are suitable for either tubed or tubeless mounting. Those OEM tires have the distinct tubeless bulbous sidewall bead, so they can serve double duty on either style rim. (I wonder if I could CONVERT those tubed rims to a tubeless style? Hmmm... read on.)

My BMW R1200GS came with TUBELESS tires. The rims are spoked, but they're still tubeless rims.

What? You're confusing me!

BMW makes a hybrid rim with a thick outer edge - that's where the spokes pass through. Instead of having 100 spoke holes running down the center of the rim, the holes are on the outer edge, and that means the inner part of the rim can act as an air chamber for a tubeless tire. They also put safety humps on the rim to keep the tubeless tire in the corral. It's a clever system.



Figure 18. A BMW tubeless rim that has spokes. Note how the spoke holes come up on the OUTSIDE of the rim. This leave the inner chamber airtight – so it can run tubeless tires.

I'm pretty sure the hybrid rims on my 1200 cost more to manufacture than the rims on my 800. In fact, I had two options when I ordered my 1200: the base model wheels were cast alloy, but I could pay a few hundred more for spoked rims. Guess which one I chose. The bean counters in Munich (or Tokyo or Milwaukee or Shanghai or wherever the bike is manufactured) make conscious decisions when it comes to the types of rims (and tires) they put on each bike. The higher price point of the BMW 1200GS meant it made their team's financial cut, so I had two options for my choice of tubeless tires and wheels. The illegitimate half-brother F800GS didn't make that team. No sense crying over spilled milk, it is what it is.

Not satisfied with their decision, I'm gonna outsmart Willi and Helmut and the accountants at BMW, and I'm gonna mount the style of tires I want on my 800 – tubeless! Keep reading.



Figure 19. Wheel off a Yamaha Super Tenere; it has spokes, but it's still tubeless. The spokes don't penetrate the inner air chamber so you can mount tubeless tires.

Not every manufacturer can use the outer spoke design like the one from BMW; that's because they own the patent. (I heard a rumor that Guzzi actually owned, but I haven't been able to chase down the real truth because I don't speak Italian.)

Recognizing the benefits of tubeless tires on adventure bikes, a few manufacturers have come up with alternate designs that use wire spokes, but still have a tubeless rim so they can fit a tubeless tire. Photo at left shows a rim off a Yamaha Super Tenere. Spokes run from the hub to rim, but instead of the spoke heads going through the center of the rim, they

attach to a pair of radial flanges that run around the inner circumference of the rim. This means the outer rim is airtight, so you can run tubeless tires.

Some other manufacturers have a variation on this design, such as those found on the Triumph Tiger 800 (right). It looks exactly like the Yamaha rim. I reckon the day will come that most brands start mounting tubeless-compatible rims on all their bikes.



Figure 20. Triumph Tiger 800 tubeless rim. Looks like the Yamaha rim, doesn't it?

Converting a Spoked (Tubed) Rim to A Tubeless Rim (so you can mount a tubeless tire)

You might be satisfied with the type of tires and wheels that came on your bike. I wasn't happy with the tubed rims on my BMW 800GS. I wanted tubeless tires, even though the rims were designed for tubes. What to do?

Is there any way to convert a spoked rim so it can run tubeless tires, and get the benefits that come with each system? Yes, of course there is. I can count 6 ways without even removing my shoes, but not all of them may apply to your motorcycle, and you may not be willing to make the concessions necessary to get what you really want.

Concession A – If you change the style of tires on your bike, you do so at your own risk. Understanding how tires and safety beads work gives you the info you need to make an informed decision. If your tire rolls off the rim because you didn't keep enough air in the tire, don't come crying to momma.

Concession B – If you change the style of tires on your bike, your dealer may shun you and/or refuse to work on your tires when you have a tire problem. You may become a social pariah, if you haven't already by virtue of riding a motorcycle. Your tubed-tire friends may ignore you, so you'll have to make some new friends in the tubeless crowd. By and large the Tubeless Boyz welcome new converts to their faith, as long as you're willing to learn the secret handshake and pay the monthly dues.

Option 1. WOODY'S Send your wheels to Woody's Wheel Works. <https://woodyswheelworks.com/>



Figure 21. Woody's Wheel Works

They'll convert the rear wheel off a big adventure bike from tubed to tubeless. You won't have a safety bead holding your tubeless tire to the tubed rim, but according to a staffer at Woody's, the rear wheel hasn't had any problems staying in place on the rim, owing to the wide profile of the rear tire.

However, **they won't convert a front wheel** on a big adventure bike, apparently because they have concerns that the narrower profile of that front tire is more likely to roll off the rim when subjected to heavy cornering loads.

They will convert both front and rear spoked rims for bikes that are used "off road". This means they'll do it for smaller trail bikes that aren't normally ridden on the highways at high speeds. I spent a long time talking to one of their reps about this. Of course I found a practical way around their logical explanations ...(see Footnote 1 at the end of this article)

Option 2. Outex Do it yourself, using the Outex sealing tape system.



Figure 22. Outex sealing tape.

Google the term “outex tubeless kit for spoke rims” and you’ll find their products on Amazon and Ebay and everywhere in between. Outex doesn’t seem to have any reservations about converting both front and rear rims, so perhaps they have a different team of lawyers. I have no personal experience with their products, so I won’t pass judgement or provide more details. A quick check of their website showed that converting a single rim costs about \$100.

I think there’s a better way that costs a lot less, and it uses two redundant sealing methods. See the next option below.

3. 3M Sealant and Tape (My Personal Favorite)



Figure 23. A portly Mr. BestRest walks you thru the process of converting a spoked/tubed rim to tubeless rim.

Do it yourself, using 3M adhesive sealant and tape. I’ve done this sealing process on my own BMW F800GS rims and it worked like a charm. This system uses 3M brand sealant AND 3M sealing tape. By using both methods I doubled my chances of successfully sealing all the spoke holes in the rim. This dual-layer system is why I believe it’s superior to Outex.

My rim conversion has held up to some pretty rough terrain and several thousands of miles. I’m 113% satisfied with the results. Several of my friends have also done it and they also report excellent results. No reports of leaking rims or spoke holes, no tire issues.

This system is much cheaper than options #1 or #2. I spent about \$50 on the tape and the sealant and that gave me enough supplies for both my tires, with enough left over to do my buddy’s tires.

This link will take you to the YouTube video where I show the entire process.

<https://bestrestproducts.com/converting-tubed-rim-tubeless-rim/>

By way of full disclosure, I’m in the motorcycle accessory business, but I don’t sell any of the supplies shown in that video. I listed suppliers at the end of the film - look there for links and resources.

4. Tubliss Install a Neutech Tubliss system. <http://tubliss.com/>

Neutech manufactures an air-filled insert that goes inside the rim. It’s basically a small diameter, high pressure inner tube that seals the spoke holes, thereby converting the rim to a tubeless design. This allows the tire to be run at ridiculously low pressures (4-5 PSI) without breaking the seal between the



Figure 24. The Neutech Tubliss system. A high-pressure inner tube seals up all the spoke holes.

tire and the rim. Ultra low pressure translates to incredible off-road traction. The insert also locks the tire sidewalls to the rim so the tire won't roll out of place.

Note that the Tubliss system is not designed for big adventure bikes. Instead, their target market is dirt bikes, and according to all reports it's the hot ticket for the dirt bike crowd.

The Tubliss system makes sense on my KTM 450's, but not on my 800GS. I would never run those extreme low pressures on an adventure bike that big and that heavy. In any case they don't make a 17" system that would fit my rear wheel rim.

One drawback to the Tubliss system is if you get a nail puncture. Put a nail thru the tire and more likely than not, the nail's also gonna puncture that high-pressure insert. Then you've really got a chore ahead of you. You'd have to pull the wheel, remove the tire and the insert, make repairs, fill the insert to 100 psi, fill the tire to the desired pressure, then reinstall the wheel assembly. Bring a sack lunch, you're gonna need it.

Cost of a Tubliss system is about \$100 per tire. According to all my dirt bike friends that use the Tubliss, it's worth every penny. And then some.

5. Tire Mousse No, we're not talking about small rodents running around inside the tire. According to Wikipedia, "tire mousse is a component in certain types of off-road run-flat tires, designed to allow them to maintain functionality despite a puncture".



Figure 25. A tire mousse. If you have more than one, you've got mousses.

Tire mousse is a continuous ring of flexible foam that's placed inside a tire before it's fitted on the rim. Mousse is a real PITA to install, according to my friends who use it. Once it's installed it has some real advantages because there's absolutely no air inside the tire, so it can never go flat.

The tire mousse gives the bike superior traction because the tires are as soft as butter and they grip like velcro. The downside is that mousse gets hot when you run at high speeds, and there's been many races lost because mousse turned to jelly. Tire mousse has a service life which is why most riders replace it every season. Cost is about \$120 each. <https://www.rockymountainatvmc.com/p/864/3342/Michelin-Bib-Mousse-Foam-Tube>

6. Tire Balls No, I'm not being crude. Yes, there actually is a product called "Tire Balls". Think of them as a series of foam rubber balls that fit inside the tire, similar to a tire mousse. They work the same way as mousse, but instead of a continuous round insert (like mousse), a series of round balls keeps the tire on the rim. Like mousse, tire balls provide the benefits of a pneumatic tire, but without the air.



Figure 26. A single tire ball with a quarter for comparison



I have no experience with tire balls and none of my friends use them , but I've read reports that they work as well as tire mousse, and they're reportedly easier to install.

Cost is about \$200 for a rear tire. You can find them here:

<https://www.tireballs.com/>

*Figure 27. Tire balls inside the tire.
An 18" rear tire will take about 30 balls.*

How Low Can You Go? Tire pressure, that is.

For street bikes I don't recommend lowering tire pressure under any conditions. Those tires are designed to function at the manufacturer's specifications. Look at the tire sidewall and see what pressure is printed on the sidewall. Then look at the motorcycle operator's manual (MOM) and see what she recommends – she's seldom wrong. I can't think of a single reason why a street bike's tires should run pressures below MOM's recommended pressures. But for dual-sport, adventure, or dirt bikes, that statement gets thrown out with the trash.

On my two KTM 450 trail bikes I run "low" tire pressures because I want maximum traction, about 12-15 PSI. Some of you are in shock by those figures so let me explain, again, in case you missed it above: The lower the tire pressure, the better the traction, as long as the tire stays on the rim, and as long as you don't get a pinch flat. This refers to the tube getting pinched between the obstacle and the edge of the rim. Yes, a tire can compress so much that this happens to dirt bike riders. Heavy duty tubes or other systems can reduce the chances of a pinch flat.

Based on what we've learned, tubeless rims and tubeless tires wouldn't be a good choice at really low pressures because of the possibility of breaking the bead and losing air. So, if you lower your pressures take that factor into account. You're balancing traction VS the ability of the tire to stay on the rim, while you also play a game of Russian roulette with the chances of damaging your rims.

What pressure should you run on a big adventure bike (off road)? A lot depends on the terrain – if it's rocky then you want more air in the tire to protect the rim (and the tube if you have one). For rocky conditions, I personally run 25 PSI front, 27 PSI rear. Of course that depends how heavily the bike is loaded. I start at those pressures, see how it feels, and make adjustments. Sometimes I go up a couple pounds if I feel sharp jolts coming through the suspension. Other times, I lower it a bit if the terrain is softer, such as soft soil or sand. Again, the lower the pressure, the better the traction.

When riding in soft soil or sand, I've run the tires in my GS as low as 12 PSI. The bike acted like a tractor in a pulling contest at the county fair, but as soon as I left that soft stuff I pumped the tires back up to a safer level. When riding in sand and loose soil, low pressured tires float over the top, whereas a stiffer, higher pressure tire tends to dig in.

And always remember that a large heavy bike, whether it's ridden on the street or the dirt, needs to run higher pressures than a dirt bike. Without that extra pressure you'll dent rims, pinch a tube, or in the case of tubeless tires you'll roll the tire off the rim and lose all your pressure.

Conclusion – What You’ve Learned

If you’ve read this far you must’ve learned something, the least of which is patience.

I explained the differences between tubed tires and tubeless tires, the differences between spoked rims



and cast rims, I walked you through the intricacies of safety beads and why they’re used, and I told you how to convert your tubed/spoked rims to tubeless rims so you can run tubeless tires.

Understanding your tires is every bit as important as understanding your Significant Other. Get it wrong and it can bite you. Get it right and you’ll have many happy years together, and hopefully most of that time will be on two wheels.

Thanks for reading this, and thanks to all my loyal customers over the last 20 years.

We’ll see you on the trail.

David Petersen

Mr. BestRest

<https://bestrestproducts.com/>

You can reach me by email: info(at) bestrestproducts.com

Footnote #1 – Woody’s Front Rim Conversion Exclusion, and how to solve the problem

When considering the friendly and professional counsel given me by the staff at Woody’s Wheel Works, I pondered the issue. What it boils down to is this: Woody’s is comfortable converting a rear wheel to tubeless, but not the front. This applies to big adventure bikes only. There must be something to this, otherwise they’d be doing a land office business converting front wheels on big bikes and making a tidy profit in the process. I have nothing but respect for Woody and his staff, but I think I have an easy solution to the problem.

It’s pretty simple: **convert the tubed rim to tubeless, but put a tube inside.**

1. Convert the front rim using 3M sealant and 3M tape, as shown in my Option 3 Video. You’ll get the advantages of running a tubeless tire, including quick and easy tire repairs.

2. Don't install a tubeless valve stem in the rim as shown in the video, instead leave that hole open for the tube's valve stem.
3. Before you spoon the second tire bead onto the rim, install the tube. Yes, install the tube! Before you put the valve stem through the rim, put some silicone caulk on the shoulder of the stem. Don't use the same 3M sealing caulk you used to seal the spokes; it's permanent and you'll want to be able to remove that stem someday.
4. Put a dab of silicone caulk in the hole where the valve stem passes thru the rim, tighten down the lock nut, and now you've sealed that air passage. Let that silicone cure before you inflate.
5. You've basically converted that front tire into a hybrid tubed/tubeless system, using **BOTH** systems at the same time. Think of this as cross-breeding a giraffe with a zebra, ending up with a lion, all while balancing on a unicycle. Easy peasy, I do stuff like that all the time, don't you? I also play with explosive gasses and use them to seat a tubeless tire in the field.
<https://youtu.be/H4c8uepdPVo>
6. Once inflated, the tube will push the tire sidewalls outward, holding the tubeless tire in place. That hypothetical tubeless-tire-rolling-off-the-rim problem has been solved.

This concept provides all the benefits of having a tube inside the rim (keeping the tire where it belongs), plus all the benefits of running a tubeless tire (ease of puncture repair).

If you get a puncture, big deal, the tube will go flat. No problem, make a repair to the main tire carcass using a vulcanizing string, then inflate. Five minutes and you're on the road again. Yes, that inner tube will still have a hole in it, but who cares? The outer tire carcass will still be holding air.

When you have a chance, take things apart and make repairs to the tube using a vulcanizing patch. As you're doing that, cut off the inner loop of the vulcanizing string, otherwise that loop will cause a hot spot in the new (or repaired) tube.

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Mountlake Terrace, WA

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The information and procedures provided in this article are the personal opinions of the Author, based on his own experiences and observations. He might know what he's talking about, or he could be totally wrong. If you decide to convert your tubed rims to tubeless configuration, you do so entirely at your own risk.