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Where's the "magic"  
in making tires?

Special Edition Three

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# Where's the “magic” in making tires

*If there's a “heart” to a tire factory, it has to be the tire builder's work station. As we've seen, modern truck tires are a combination of many different parts, some of rubber, some of steel.*

*How do these parts – most of which look nothing like a tire – come together to make a tire? As we'll see, it's through the skills of a very important worker, called a “tire builder,” and an ingenious piece of equipment called a “tire assembly machine.”*



*Tread "Cap"*

*Tread "Base"*

*Undertread*

*Belts*

*Mini-sidewalls*

*Belt edge inserts  
and fillers*

*Sidewalls*

*Innerliner*

*Casing Ply*

*Soft bead filler*

*Hard bead filler*

*Chafer*

*Bead bundle*



### How do all the parts of a tire become a tire?

We said it's "magic," and in some ways, it's not far from that. Of course, like all real magic, it's really a combination of skill, ingenuity, technology and elegant design.

The first thing that happens is that all of the many "parts" of the tire have to be brought to a single location, where there's a tire builder and a tire assembly machine (which from here on out, we'll call the "TAM" – for short).

### What is a "TAM"?

A TAM, in essence, is a big, horizontal drum. Its diameter is about the same as the final "hole" in the tire will be.

It's the "workbench," if you will, on which the tire builder will assemble all the parts that make up the tire.

### How does it start?

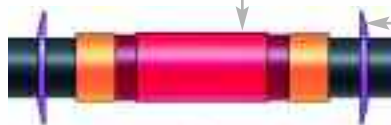
Usually, the builder will slip the bead subassemblies over the drum first.

### What are those?

Rather than try to put all the parts together individually at the TAM, some parts are delivered to the TAM pre-assembled. Beads are like that. The wire bead bundles are combined with the bead fillers and the whole thing is put onto the drum at once.

### And after that?

In essence, tires are built from the inside out. You remember that the very innermost layer is the innerliner. This is a piece of multi-layer calendered rubber. The tire builder wraps this onto the drum, splicing the ends together to make what amounts to a tube.



### How is it spliced?

The ends are overlapped slightly and pressed together. At this stage, all of the rubber in a tire is still uncured, so it's fairly sticky. Later, the curing process will cause each of the pieces of rubber to chemically bond to each other.

Throughout the building process, it's almost as though the parts are "glued" with fairly weak glue.

After curing, it's as though all of the parts are "welded" to each other.

### What's next?

Not every tire is built exactly the same way, but in general, the next thing would be the body ply. This is that rubber-and-steel "fabric" made by combining the steel wires and rubber in the calender.

Again, the body ply may be delivered with other parts, like belt edge inserts, pre-attached to simplify things and save time.

### Time for the belts and tread?

Not just yet. Here's the problem: Up to now, we've been wrapping flat components around a drum that is closer to the size of a wheel than to anything else.

But the circumference of the belts and tread is a lot greater than that of a wheel. If we just put them on at this point, it would be like a loose rubber band.

What we have to do is get the rest of the casing (which is what we call what we've built so far), into the shape of a tire and up to the proper size to receive the belts and tread.

### How is that done?

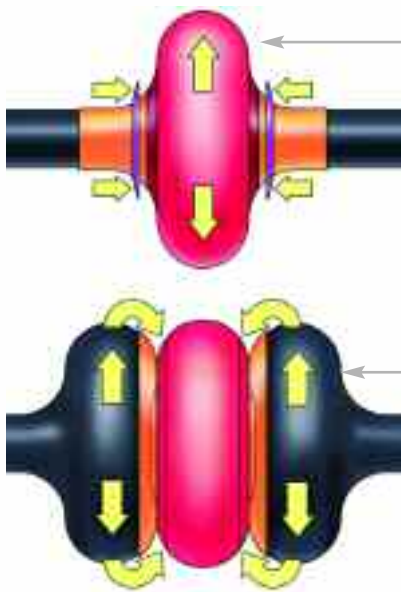
That's the "magic" part of the TAM. A rubber bladder, like an innertube, inflates inside the layers we've already





put on. At the same time, the drum sort of “shortens” itself, pushing the outside edges of the various layers together.

The result is a big bulge in the center, that’s starting to look a little like a tire. But we’ve got something else to do.



#### What’s that?

We have to fold the edges of the body ply over the beads to secure them to the casing. A separate set of bladders inflates to do that.

#### And then?

Next are the belts. Most Bridgestone radials have four full belts, and on the tires we watched being built, the belt “package” was delivered to the builder with all four belts assembled as a single unit.

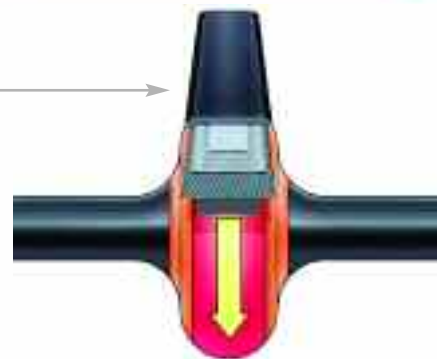
All of these components are wrapped around the casing and carefully spliced to minimize any irregularity that could cause ride disturbance or other problems.

In fact, each layer is spliced at a different place on the circumference of the drum, so that no two splices will sit on top of one another.

#### Does the tread go on the same way?

For best results, Bridgestone actually pre-cuts the tread stock to the exact length and splices the ends together, making sort of a big rubber band. Belts and tread are slipped over the pre-shaped casing as a single unit.

Now we have all the components assembled on the TAM.



#### Is it ready to go to the mold?

Just a couple more things to do. The TAM starts spinning, and as it does, rollers come in and press all the various parts together.

The pressure forces all that sticky rubber together, and the rollers move all over the tire, squeezing out any air that might be trapped between layers and pressing each component firmly against the others.

This process is called “stitching,” and you’re probably familiar with it from watching retreading.

At this point, we call what we have a “green tire,” and it’s ready to go to the curing room.

*Editor’s Note: Next time, we’ll see how “green” tires are “cured” to bind all their parts together into the final product. TA*

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