



# How to Build a Radial Tire



Tires are not just round and black they are sophisticated products that can take years of research and development to produce. If you have ever wondered how tires are made, the following is a roadmap for the construction of a radial tire:

## Start with Rubber and Additives

Tire construction starts when raw chemical additives such as sulfur, carbon black and solvents are combined with natural and synthetic rubber. The process takes place in a large machine called a banbury.

In addition to mixing and grinding, the banbury heats the rubber to make it workable in preparation for further applications. The raw product emerges in the form of long, flat bands of rubber, which are then worked in rolling mills.

## Six Main Components

It takes several machines to shape the rubber into the individual components of the tire: tread, ply, belts, beads, sidewalls, and innerliner.

- The tread rubber is extruded through a tuber, then measured, cooled and cut into precise lengths.
- Sidewalls are also extruded through tubers, along with the white rubber for a white sidewall or white lettered tire if required.
- The ply is produced in a calender mill, which combines thin sheets of rubber and fabrics like nylon or polyester. The large sheets are cut to width, rolled and transported to the assembly area where all the components will come together.
- At the same time as the raw rubber is transformed into the tread and plies, the creel room equips the tire with its basic strength. Fine steel wire goes into the manufacturing of belts for the steel-belted radial tire. Rubber from the mills and steel from the creel room are molded together into wide flat sheets, cut on the bias, rolled, and moved to the tire-building machine.
- The innerliner is a impermeable layer of rubber on the inside of a tire which creates a airtight chamber when fitted to the vehicle wheel. This layer eliminates the need for a innertube.
- The last major component of the tire is the bead. The beads are created out of wrapped steel wire, covered with rubber and formed into hoops. The bead anchors the fabric plies of the tire and seats the tire firmly on the wheel.

### The Green Tire

The six components (tread, ply, belts, sidewalls, liner and beads) come together on the tire-building machine. These six components are assembled into what is known as an uncured, or green, tire in two stages.

The carcass of the tire, including beads, plies, sidewalls and liner, is constructed on one side of the machine. The tread and the underlying belts are assembled next to the carcass on the other side of the machine.

The two sub-assemblies are then joined together and the result is a green tire.

### Vulcanization

The next phase is vulcanization, the molecular transformation of the soft, gummy green tire into the tough, and long-wearing, modern passenger tire. The green tire is placed in a curing mold and is subjected to intense pressure and high heat internally and externally for a specified period of time. Simultaneously, the tread pattern is imprinted onto the rubber. When it comes from the mold, the tire is ready for final finish and inspection.

### Final Finish and Inspection

For showroom quality, any excess rubber is trimmed off the cured tire. Every tire is thoroughly inspected. The tire then undergoes various uniformity checks to assess ride and comfort quality. Once the tires have passed all the checks and inspections, they are sent to the distribution warehouse for shipment.

