2.0.0 TYRE

2.1.0 DEFINITION

2.1.0 WHAT IS THE TYRE?

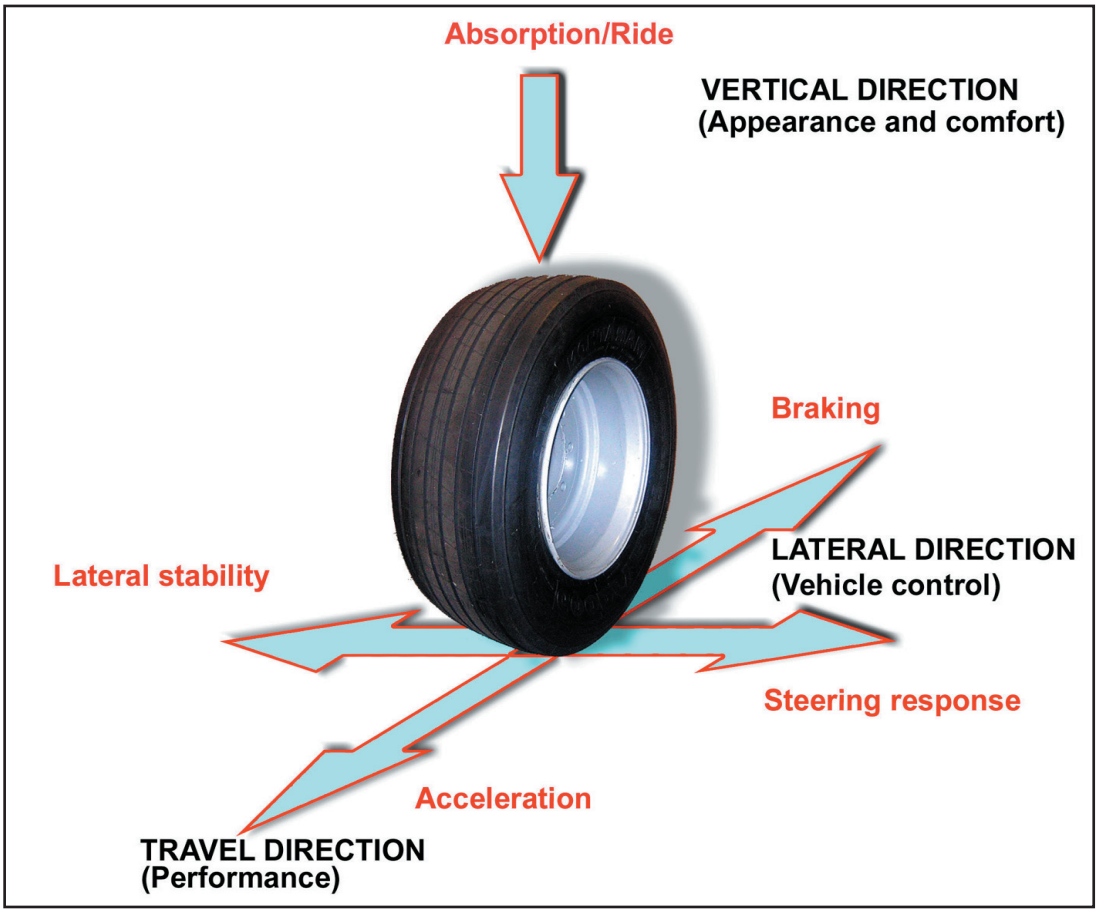
Geometrically, a tyre is a toroid

Mechanically, a tyre is a pressure-containing flexible membrane

Structurally, a tyre is a high-performance composite

Chemically, a tyre is made up of materials consisting of bonded molecules

2.1.1 TYRE FUNCTION.



- To have load capacity
- To guarantee absorption capacity
- To transmit drive and braking torque
- To produce steering force
- To have steering response
- To have dimensional stability
- To give satisfactory mileage performance
- To have good steering response
- To absorb a minimal amount of power
- To generate minimal noise and vibrations
- To be durable and safe.

2.2.0 TYRE SERVICE REQUIREMENT

+ = IMPORTANT
- = LESS OR NOT IMPORTANT

APPLICATION	CAR	SPORTS	TRUCK	EARTH MOVING	TRACTOR	PLANE
TREAD RESISTANCE	+	-	+++	++	++	+
DURABILITY	+/-	-	++++	++	++	+
HIGH SPEED	+	++	+/-	-	-/+	++
HIGH LOAD CAPACITY	-	-	+++	++	+++	++
TRACTION	+	++	+	++	++++	-
ROLLING RESISTANCE	+	-	++	-	+	-
TEAR AND CUT RESISTANCE	-	-	+	+	++	+
GROUND COMPACTING	-	-	+	++	+++	----
HANDLING AND RIDE	++	-	+	++	+++	----

Different applications require different tyre performance. Tyres for specific vehicles and/or applications therefore have to be specially designed (constructions and compounds).

2.3.0 TRUCK TYRE COMPONENTS

- Tread
- Belts 1-4
- Internal Lining
- Bead wires
- Sidewall
- Shoulder filler
- Filler
- Carcass
- Bead apex
- Fillers 1-3
- Reinforcement
- Bead wire wrapping

Typical example:

Components	41
Compounds	10
Types of steel	5
Ply textiles	1

2.4.0 COMPONENTS FUNCTIONS

TREAD guarantees traction, withstands wear and protects the carcass beneath.

BELT comprising several layers of low-angle steel cords, it guarantees the tyre has the necessary resistance, stabilises the tread and prevents puncturing of the carcass.

SIDEWALL protects the carcass against wear, damp and knocks and provides flexibility.

PLY radial ply (90°) transmits all the forces (driving, braking and steering) between the wheels and the road and prevents bursting due to the loads at the operating pressure.

INNER LINING a layer of special rubber in tubeless tyres which prevents air leaks.

BEAD WIRE the steel bead wire holds the tyre in place and seals it against the rim.

FILLERS rubber fillers around the bead and in the bottom of the sidewall to provide a gradual transition between the rigid and flexible parts of the sidewall.

BEAD EDGE layer of rubber and steel wires above the radial edge of the plies, to strengthen and stabilise the area of transition between the bead and sidewall.

COATING layer of hard rubber to prevent erosion of the bead area against the rim flange.

INNER TUBE rubber tube to contain air and prevent leakage, for separate fitting in tube-type tyres.

FLAP strip of rubber fitted between the inner tube and the rim. Protects the inner tube against pinching and damage by the rim.

2.5.0 UNISTEEL STANDARD TYRE CONSTRUCTION CHARACTERISTICS

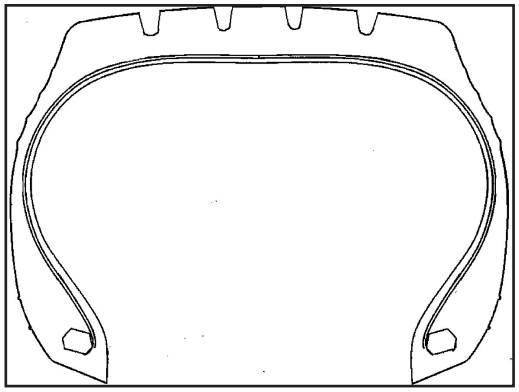
Tread : total profile is in function of tread deeply

Sub-tread = 6 mm, 3 mm of which is regroovable

Shoulder filler to support the ends of the belts

Multiple hard rubber fillers

Single coating in rubber alone



Carcass/Plies
Single layers, in steel

Bead Wire
The shape depends on the shape of the bead seat (flat or profiled)

4-Layer Belt Pack

1 Transition
2 & 3 Working
4 Protection
+ spiral belts in some cases

Sidewall
The profile depends on the tyre's application
(e.g. stronger profile on urban bus tyres)

Individual reinforcement (partial or total)
in steel wire

2.6.0 TRUCK TYRES: COMPLEX ITEMS WHAT DOES A TYRE CONTAIN?

SYNTHETIC RUBBER	9%
SILICA	4%
OILS	2%
NATURAL RUBBER	34%
CARBON BLACK	19%
STEEL WIRES	18%
CHEMICALS	14%

2.7.0 FLEXING

Tyre flexing is on the 3 planes:

Vertical force Lateral force Longitudinal force

Vertical flexing is the factor which has the most influence on the tyre's performance and durability

- In practice, the amount of work the tyre is required to do depends on the frequency and degree of dynamic vertical flexing.
- If its operating conditions are too extreme, the tyre fails.

2.8.0 CONTACT AREA / TYRE PERFORMANCE

- For any given load and pressure, the tyre with the largest contact area is normally the best in terms of overall performance.
- The size of the contact area may be changed by the pressure (the lower the pressure, the greater the contact area). However, a momentary variation in pressure is tolerated.
- The unit of pressure on the ground is directly proportional to the load applied to the tyre and the contact area. Both play a major role in tyre design. Ideally, the unit of pressure should remain constant across the entire contact area; however, this is not possible because the tyre is curved in both directions (lengthways and crosswise).
- Compared to diagonal ply tyres, the variations in the unit of ground pressure in radial ply tyres are lower, because the tread arc radius is flatter and the belts have a stabilising effect.