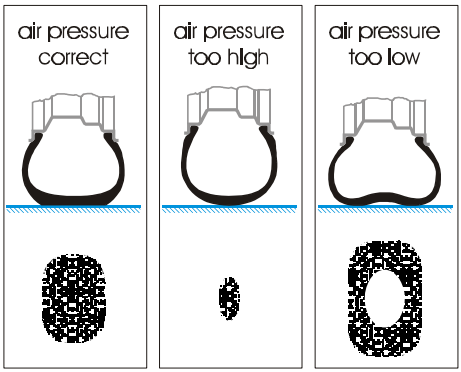
Question

What does the accurate tire pressure depend on?

Answer

Accurate air pressure in a tire is necessary to make the tread lie uniformly on the ground.



Tire cross sections (top) and
contact areas (bottom) on solid ground

Engineering Optimum road grip needs a tire tread lying uniformly on the ground. This can only be accomplished by having the right air pressure, as indicated in left part of the figure.

Wear Excessive wear of the middle part of the tread indicates exceeding air pressure. More than fair wear and tear of the outer areas of the tread comes from deficient air pressure.

Physics Pressure equals force devided by the area.
The air pressure inside a tire is lead through to the contact area outside virtually without change, since a tire represents a rather soft shell.
In other words, the pressure of the contact area on the ground corresponds to the air pressure inside the tire. The load (= vehicle weight + loading) a tire supports requires as more contact area as less air pressure is inside.

Loading Consequently the air pressure has to be increased if we have heavy load. As there is a construction-conditioned maximum pressure for every tire this load limit is written on the side wall of every tire.

Minimum contact area High air pressure (center of the figure) causes a minimum of work of deformation. Hence, road racing cyclists favor a pressure between 6 and 9 bar. Track racing cyclists on their extreme smooth tracks can even increase the pressure to 12 or 14 bar.

Maximum contact area Endeavoring to reduce soil compression in agriculture the exerted pressure is minimized (right part of the figure). So the pressure in tractor tires sometimes is only .8 up to 1.2 bar. Consequently the contact area and with it the whole tire turns out gigantic.