

Pneumatic tires - the preferred option

Advantages of pneumatic tires

A pneumatic tire would be ideal, as it would run directly on the steel surface of the tube, potentially saving billions in tube construction costs. The tire is capable of absorbing small bumps in the tube, as well as providing good traction for acceleration and braking. The construction could be very thin using modern aramid and carbon fibres, this would reduce friction and heating.

The development of a pneumatic tire at Hyperloop speeds would be very challenging, but with considerable benefits. Tires have done over 1000 km/h, but high-speed testing is needed to prove if Hyperloop speeds (maybe reduced to 800 km/h) could give acceptable durability.

Compared to conventional tires, wear rate would be improved by the smooth tube surface, and harder wearing materials such as polyurethane can be used, as wet grip is not required.

The image shows a possible pneumatic tire. The walls are quite thin to reduce energy loss and heating. The tread is hard-wearing rubber or PU, which runs on the polished steel.

A solid rubber tire would overheat immediately because the friction heat is absorbed into a small volume of material.



Testing is the key to development

The tires by the speed record heroes in the '60 worked well despite little development. The wheels and tires were supplied by Goodyear and Firestone for promotional reasons.

The tires were running on the rough and abrasive surface of the salt lakes, but obviously the length of the track was limited. The tires on the jet-driven cars lasted well, however the wheel-driven cars suffer wheels-spin and wear at high speeds. So the ultimate durability of the tires is not known.

So testing is required to find what are the issues with high speed. The tire will have some rolling resistance, which is converted to heat, and that heat need to be dissipated. The basic solution is to reduce the rolling resistance, by making the tire thinner. The design needs less rubber, as there should be no kerbs, potholes or foreign objects in the tube. A thick tread is not required to drain water.

The Hyperloop tire has very different requirements, and will evolve in different ways to normal road tires. High-speed testing will achieve good results because it has never been done before.

Alternative wheel and tire designs

Tire research could develop a completely different form of tire.

This is a racing bicycle tubular tire, which has the lowest drag of any pneumatic tire, with a L/D of about 300:1.

Airless wheels have been proposed, this one is a Bridgestone airless wheel design.

