Can we really reinvent the Wheel?

By David K Gibson 8 March 2016

BBC Autos: http://www.bbc.com/autos/story/20160308-from-brain-coral-a-smarter-tyre

With magnetic levitation and a 3D-printed tread pattern inspired by brain coral, the sphere-shaped Eagle-360 could be the biggest advance to tyre tech since vulcanised rubber.

We write a lot about autonomous vehicles, and have explored the special sensors, interfaces, communication systems, and computing power that will be integral to their inevitable deployment. We hadn't, until now, thought much about the tyres. But then, we don't work for Goodyear.

"We aren't trying to predict the future, but we're looking to the future of mobility and connectivity," says Goodyear's Keith Price, spokesperson for the company's R&D arm. At last week's Geneva motor show, the tyre and rubber company unveiled two new concepts specifically designed for autonomous vehicles. The first, called the Eagle-360, literally reinvents the wheel (a cliché we imagine is banned company-wide) with a stunning spherical design.

Goodyear Eagle-360 Concept (Credit: Goodyear)

The advantages of ball-shaped tyres are legion. Using them, an autonomous vehicle could move in any direction at any angle at any time, spinning the vehicle in place to turn around, making completely parallel lane changes, or crab-rolling sideways to parallel park in a tiny space after dropping its passengers. These manoeuvres are impossible to execute using a human/steering-wheel interface (which requires forward

momentum to execute a turn), but with a robot in charge of a spherical tyre, just about anything is possible.

The disadvantages of ball-shaped tyres are rather more obvious. A sphere has no central axis, and therefore no axle wherewith to affix something like a vehicle or a drivetrain. The Eagle-360 (in concept) will overcome this design constraint by using magnetic levitation to suspend a vehicle above its tyres, and use the same technology to drive and brake them. Of course, maglev technology is today deployed only in the very linear application of trains. Goodyear isn't currently working with a technical partner to develop a rounder version of maglev — at least pre-Geneva. Says Price, "I wouldn't be surprised if there have been conversations after the unveiling."

(Credit: Poelzer Wolfgang / Alamy Stock Photo)

The 360's tread pattern is a brainy solution to another problem. While linear treads make a ton of sense when a tyre rolls around a single axis, a sphere needs to grip no matter which way it's going. To achieve this, Goodyear looked to nature, mimicking the whorls of brain coral in the 3D-printed tread design. This leaves the tyre looking something like the rubber balls from gym class, and gripping like the pads of a human fingertip. Like your fingertips, the 360 would become softer and grippier in wet conditions, but stiffen when dry. "Looking at how to adapt tread compounds is something that goes on today," notes Price. "We're always asking, 'How can you maximize what you get with grip, mileage, and wet traction?'"

The second tyre — in a boring, old toroid design — is the Goodyear IntelliGrip. Though it lacks futuristic optimism, it makes up for that with imminent practicality. It is, in fact, a rather logical extension of integrated tyre-pressure monitors.

Goodyear IntelliGrip Concept (Credit: Goodyear)

“As you remove humans from the equation, cars will have a lot more to do themselves,” notes Price. “That means a lot higher sensor content from the vehicle for reading the environment and the road.” Logically, the best place to read the road is where the rubber meets it, and the IntelliGrip is a quick study. It (again, in concept) will have integrated sensors for road surface and weather conditions, monitor its own wear, cue the vehicle to reduce speed or power to the wheels, and even adapt itself to shorten stopping distances or grip better in turns. Goodyear is collaborating with some unnamed auto companies to integrate these kinds of sensors into future control systems.

Price is quick to point out that these tyres are only concepts. “These are mere possibilities, and what we do with our concept tyres is much like what car companies do with concept cars,” he says. “It’s a way to let the R&D folks look at what might be coming and begin the conversations around it.”

Goodyear doesn’t think we’ll ever see these two tyre models exactly as they appeared in Geneva, but elements will certainly find themselves in future products. “I hear auto manufacturers say that by 2035, they’ll be selling 85 million autonomous cars a year,” says Price. Someone is going to have to make those tyres.

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