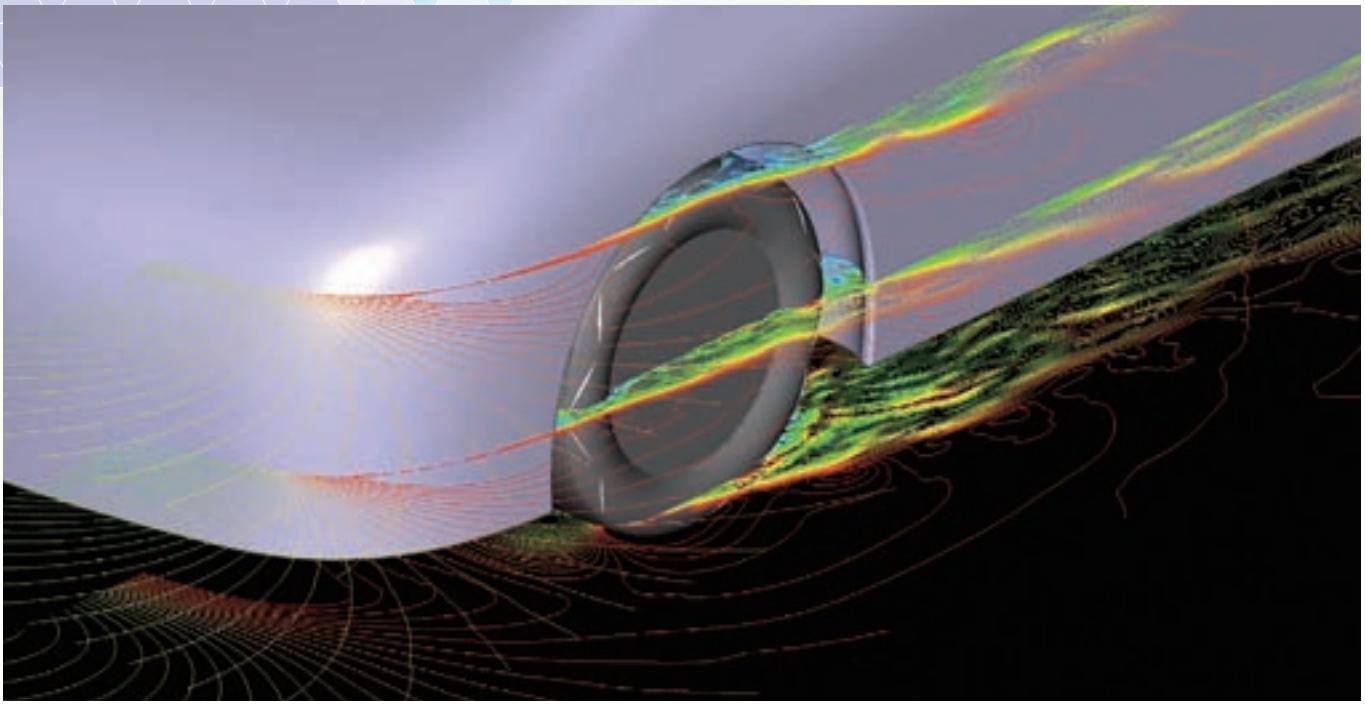
Taking Yokohama Rubber's technology to a whole new level



Airflow around a moving vehicle (conceptual image)

Further improvements in aerodynamic technology

Yokohama Rubber pays considerable attention to aerodynamics, specifically to controlling the airflow around the sides of a moving tire; this is partly to reduce tires' rolling resistance, and also for the potential environmental benefits. Since 2010, we have been undertaking ongoing research using aerodynamics simulations.

When a vehicle is moving, it is affected by air resistance acting from various different directions; the amount of air resistance experienced by the vehicle can affects its fuel consumption. At the same time, airflow around the vehicle's tires is highly complex, and it is known that this movement can affect the air flowing around the vehicle as a whole. By changing the airflow around the tire, by means of adjustments to the tire's shape (including the adding of small protruding "fins" to the side of the tire), it should be possible to reduce the air resistance of the vehicle as a whole, thereby contributing to an improvement in fuel economy. This concept was the starting point for the R&D that Yokohama Rubber undertook.

With the latest technology, simulations indicate that it should be possible to reduce vehicle air resistance by 2 – 3%, roughly equivalent to reducing tire rolling resistance by 2 – 3%.

Thanks to this attention to airflow and the resulting R&D work, Yokohama Rubber has succeeded in developing new aerodynamic technology that helps to control vehicle lift when a vehicle is moving. Controlling lift not only contributes to vehicle safety, it also has a positive impact on vehicle stability; up until now, it had proved difficult to combine effective lift control with low air resistance. Yokohama Rubber's new aerodynamic technology, which reduces air resistance while also controlling lift, is thus a real breakthrough.

In the future, Yokohama Rubber will continue to build on these research achievements to realize further improvements in tire performance.

Adding protruding fins to the side wall of the tire helps to control airflow

Laying the foundations for next-generation technology

Development of biomass-derived synthetic rubber

Synthetic rubber, the main raw material used in tire manufacturing, is generally derived from petroleum. Producing synthetic rubber from biomass rather than petroleum could contribute to a significant reduction in carbon dioxide emissions. Yokohama Rubber has been undertaking a variety of research programs in collaboration with external research organizations with the aim of developing biomass-derived synthetic rubber. In fiscal 2015, this research bore fruit with the successful development of two important new technologies.

The first of these breakthroughs, resulting from collaborative research by Yokohama Rubber and Tokyo Institute of Technology, is the development of technology for synthesizing butadiene from cellulose (a sugar that is a key component of plant fibers) using industrial solid catalyst technology. Butadiene rubber, which has outstanding durability and resistance to low temperatures, is one of the most widely produced and widely used forms of synthetic rubber; if biomass-derived butadiene can be effectively commercialized, then this can be expected to lead to a significant reduction in the amount of fossil fuels consumed.

The second breakthrough is the result of collaborative research between Yokohama Rubber, National Research and Development Agency RIKEN, and Zeon Corporation. Using cell design biotechnology, we have succeeded in developing technology for synthesizing isoprene (the raw material for producing synthetic polyisoprene rubber) from biomass. Synthetic polyisoprene rubber has a chemical structure very similar to natural rubber, and is sometimes referred to as "synthetic natural rubber." The development of this new technology has immense significance; not only will it contribute to reduced consumption of fossil fuels, it will also provide a new raw material that can supplement natural rubber (which is characterized by pronounced fluctuations in both price and production volume).

If these biomass-derived synthetic rubber technologies can be commercialized, then it should be possible to reduce the carbon dioxide emissions associated with rubber manufacturing to around one-quarter of the current level. While there are still significant obstacles to be overcome in terms of production cost, etc., nevertheless, whether viewed in terms of reducing the burden on the environment or of ensuring a stable supply of raw material, there is a clear need to continue undertaking R&D aimed at the commercialization of these technologies so that they can be used to revolutionize the mass production of tires.

[Biomass-derived synthetic rubber]