



TIRE INDUSTRY

Major technical challenges associated with tire industry

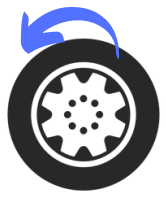


LACK OF TIRES SUITABLE FOR SELF-DRIVING VEHICLES

Autonomous vehicles are generally heavier than traditional cars. This extra weight puts additional pressure on tires and also increases tire noise. So, there is a need for tires that can withstand high pressure and dampen the noise of autonomous vehicles

LACK OF TIRES SUITABLE FOR ELECTRIC VEHICLES (EVs)

EVs are hard on tires. Electric motors in EVs generate immediate torque that chews up rubber. As such, there is a need for tires that can withstand high torque.



NEED TO MAINTAIN OPTIMUM ROLLING RESISTANCE

Lack of rolling resistance decreases the traction whereas a lot of resistance results in more fuel consumption, leading to more GHG emissions. With more stringent regulation on GHG, tire manufacturers are pushed to develop tires having an optimum rolling resistance

LACK OF EFFECTIVE RECYCLING METHODS AND ALTERNATIVE SOURCES TO EXTRACT NATURAL RUBBER

A tire is made up of natural rubber and natural rubber trees are exhaustible natural resources. Due to this, recycling methods and alternative sources for natural rubber production are needed for a sustainable future

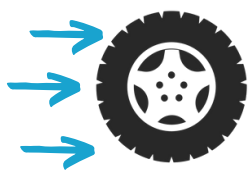
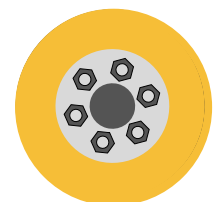


SOIL COMPACTION

Soil compaction occurs when soil particles are pressed together. This can not only destroy the porous soil but can also make the land infertile. The huge weight of tractor tires is also one of the reasons for this and companies are trying to solve this issue.

VULCANIZATION ENERGY LOSSES

During vulcanization of tire, high energy is dissipated due to long mold opening time. This causes significant energy loss and decreases efficiency. Hence, the long mold opening time needs to be decreased



TIRE TREAD NOISE AND AGGRESSION

Bigger treads (incisions) in heavy work tires cause mechanical aggression which in turn causes disturbances. These disturbances in the air resonate with each other and cause a drumming sound. For the better comfort of an automobile, tread noise and aggression should be monitored.

NON-SYMMETRIC TIRE MOULDS

In certain applications like all-terrain and off-road tires, extending treads are needed for enhanced functionality, traction, and aggressive appearance. However, due to constraints on mold design for existing equipment, limitations on mold segment designs and tread alternatives have been limited

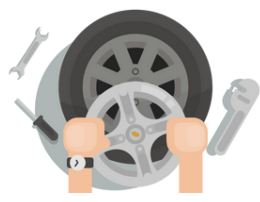


APEX DESIGN LIMITATIONS

Automobile tire includes radial plies which are wrapped around two annular inextensible beads. The area between the plies that extends tangentially to the beads is called the apex. Apex design should not have any curls or splice as it directly impacts tire weight, sidewall stiffness, ride comfort, material fatigue, and tire life, and various significant properties.

WASTE GENERATION HARMING MARINE LIFE

Tires are a major source of micro-plastics. These micro-plastics are found to be a major river contaminant harming marine life. Therefore, proper waste management and recycling processes of tires should be brought into force as soon as possible



LACK OF DIGITAL TOOLS

New insights from digital technologies can help manufacturers make better designs, optimize operations and maintain decisions for their tire production. Thus, tire industry should accelerate its adoption of digital transformation initiative aligned with optimizing the tire lifecycle

COOLING SYSTEM FOR TIRE

Strength and tire deterioration rate are dependent on the temperature imparted to the tire. Safe load-bearing capacity also decreases as the tire temperature increases. Exposure to very high temperatures also affects the durability of tires. Hence, an efficient cooling system is needed for tire positioned in a vehicle.



RUBBER OXIDATION DEPLETING TIRE LIFE

When rubber is exposed to oxygen, it dries out and becomes stiffer which further results in cracks on its surface. When pressurized oxygen gets permeated into the tire rubber, it dries out due to oxidation. The tire starts looking old and aged when its outer layer is dry and full of cracks. Thus the oxidation nature needs to be controlled to increase tire life.

HEALTH HAZARDS TO PRODUCTION WORKER'S HEALTH

Several volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) are present at different points of the tire's vulcanization unit. The workers in those vulcanization units are at a high risk of cancer due to direct exposure to SVOCs and VOCs.



LACK OF VEHICLE CONTROL DUE TO HYDROPLANING

Skimming or sliding on the top of a water film between tires and the road which results in a loss of steering capabilities and braking effectiveness is termed as hydroplaning. Thus, the tire design needs to be altered in such a way that can tackle the hydroplaning situation.

WEIGHT CONSTRAINTS

Tires are expected to possess a high strength-to-weight (specific strength) and stiffness-to-weight (specific modulus) ratio for a good design. To achieve this, tires need to perform a meaningful and feasible reduction in their weight by also keeping the cost consideration in mind.

