RubberNews.com

Tires and conservation

Jacques Bajer
September 18, 2006

The most effective way tires could contribute to conservation of raw materials and energies is by delivering twice the mileage of current tires and doing so, as much as possible, with renewable raw materials and energies. And when they've worn out, they need to be recycled efficiently.

When radialization began in America, the promise was that radial passenger car tires could provide not only superior performance but also significant savings in vehicle operating expenses by doubling tire life to 50,000 miles and reducing vehicle fuel consumption.

Achieving these goals, while preserving the then-notoriously known American demands for high level of comfort, low level of noise, ease of operation and handling characteristics (when equipped with bias ply tires), was not an easy task. But by 1966, before the creation of the National Highway Traffic Safety Administration, and before the first world oil crisis of 1973, these criteria were met with radial tires.

Due to a marketing-driven proliferation of tire types, sizes and aspect ratios, a large percentage of radial passenger car tires today provides only 30,000 miles of service, if that. With the technological advances achieved to date, one would think that today's tires should deliver 100,000 miles.

If this were so, the industry would not need to produce more than twice as many tires, rubber, chemicals, carbon blacks, bead wire and steel and textile cords, which in turn would significantly reduce the amounts of energies required, not only to produce these materials, but in the tires themselves.

A complicated product

The radial passenger car tire is a complex product, which still defies precise/relevant mathematical modeling. The tire structure is discontinuous and exhibits high stress/strain concentration points and a highly variable thermal profile.

The tire requires many components produced from highly dissimilar materials, its bulk consisting of rubber compounds used in application-specific positions throughout the tire cross-sectional structure. Rubber compounds and other materials used in tires, such as thermoplastics, are temperature sensitive and unstable, depending upon operating conditions (bead wire and steel cords excepted).

To perform smoothly and reliably, long-life tires must be manufactured with a high-precision process operating in a well-controlled, uncontaminated environment. Ideally, to deliver such a long life, the tires should operate on a vehicle also developed with high precision in mind, and featuring chassis and powertrain system designs conducive to such long tire life. Can today's radial passenger tire architecture and involved materials withstand 100,000 miles of service on currently produced vehicles?

In view of the depletion of petroleum and natural gas reserves and the high demand for these resources worldwide, as well as the aspects of tire performance and economic effectiveness mentioned earlier, a realistic energy policy will have to be implemented in America and be given top priority.

Petroleum and gas are needed to produce synthetic rubber, nylon and polyester cords. Solving the world's energy problem is a long-term proposition, with the solution lying in using renewable, secure, stable energy sources and prices instead of traditional petroleum and natural gas energy sources with their highly fluctuating pricing structure.

Types of energy

What is the best, cleanest course of energy today? Atomic fission is one of them, and has been used for years to produce most of the electricity in France. Atomic fusion is another and is under development in France. Hopefully, atomic fusion energy will eventually become available. Developing renewable energies today is one of the main challenges in sustaining future industrial development.

Natural rubber, derived from rubber trees and used for radial tire structural components, is a renewable resource. So again is cellulose, from which rayon tire cord is produced.

Rayon is the material of choice for the body of high-performance and run-flat radial ply tires, which, due to their operational characteristics, require heat resistant, mechanically efficient/stable tire cords. Derived from wood pulp, cellulose is more stable and less temperature-sensitive than nylon and polyester cords-both petroleum-based materials. Why not use such renewable materials for mainstream tires instead of oil- or natural-gas-based materials?

Since its introduction, the radial passenger car tire has been the subject of a steady evolution, through which many problems were solved. Among these developments, one clearly stands out: the use of cap plies in 1969, after 20 years of the tire being in consumer use.

Under the effect of centrifugal and other forces, and torque, shocks, impacts, high speed and high temperatures that the tires must endure in the process of providing vehicle functions, the tire's heavy steel cord belt/tread sub-assembly wants to detach itself from its radial casing. Only the adhesion and tear strength of the rubber compounds tying it to the radial casing prevents this from happening.

The use of cap plies resulted in a definite amelioration of tire structural integrity, which in turn markedly reduced the incidence of belt/tread detachments. This, however, came at a price-additional tire components and compounds, more equipment to handle the additional tire components' assembly steps, new molds and increased tire curing time. All this complicated an already complicated tire design. But in 1969 there was no option, and today cap plies continue to be used.

The future lies in reducing the current tire design and manufacturing complexities, reducing the tire energy content for raw materials and tire production, reducing tire and wheel sizes and types, and developing materials that can do more with less.

Entering into such development requires an effective, long-term collaboration with vehicle producers, in order for tire and vehicle to complement each other, with the objective to maximize tire life and vehicle operating smoothness and to minimize vehicle fuel consumption.

Such challenges require creativity, but creativity is unpredictable and needs an environment conducive to flourish.

Is the current U.S. industry environment, with its heavy emphasis on short-term profit and stockholder rewards, conducive to creativity?

Do we have the talents, practical experience, patience, willpower and dedication to meet this challenge, or will we also outsource this task to other countries and merely become an import or sales and service industry nation, with its engineering and manufacturing middle class disappearing, and only the rich and working poor remaining?

Jacques Bajer is founder and owner of Tire Systems Engineering Inc. in Grosse Pointe, Mich.

Close window