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INNOVATIONS IN AUTOMOTIVE INDUSTRY

INOVÁCIE V AUTOMOBILOVOM PRIEMYSLE

Michal DEMEČKO – Jaroslava KÁDÁROVÁ

Abstract: This article deals with innovations in automotive industry. It describes how huge investments automotive industry is making and it makes it a leader in innovations. It describes key areas of innovations in automotive industry, such as: power train, lightweight materials, connectivity and active safety and assisted driving.

Keywords: Innovation, Automotive, R&D

Introduction

Today’s automobile is the most sophisticated technology owned by consumers. From the early stages planning, automakers design innovations into new vehicles, recognizing that technology provides many solutions to meet consumer needs. An auto must function in the harshest climate conditions, from freezing cold to 100% humidity to desert temperatures… running on the roughest roads, from urban potholes to unpaved country roads… performing at highway speeds… for as much as a 300.000 km lifetime… while meeting thousands of regulatory standards. Virtually every aspect of the modern automobile is now high-tech, uses a high-tech material or was developed through a high-tech process. As a result, automakers rank at the top of lists on most innovative companies, and automakers are recognized leaders in R&D investments.

To keep pace with ever-growing consumer demands for sophisticated new technologies, recent studies show automakers spend more than $100 billion annually on research and development (R&D). How large are automaker investments in R&D? For perspective, Booz & Co. reported the entire global aerospace and defense industry spent about $25.5 billion on R&D — one quarter of what the auto industry spent.

Booz & Co.’s survey of annual global R&D expenditures also found five automakers among the top 20 in corporate R&D spenders. Booz reported one leading automaker spent nearly $10 billion. Most recently, the European Commission’s 2013 EU Industrial R&D Investment Scoreboard ranked another automaker as the world’s largest private sector R&D investor, with investments of €9.5 billion.

Innovations and Research & Development

Automotive R&D spending and needs are expanding rapidly to keep pace with the demands for ever more sophisticated and effective new technologies. Worldwide, automakers spend an average of $1,200 for research and development per vehicle. They provide 16 percent of total worldwide R&D funding for all industries, trailing only the computer and electronics industry and healthcare research. Furthermore, although auto industry research spending is smaller than the computer and electronics industry (which provides more than a quarter of all global R&D funding), growth in automotive R&D spending is on a par with both industries, increasing the amount spent on R&D by more than $7 billion from 2012 to 2013.

Five automakers–Volkswagen, Toyota, General Motors, Honda, and Daimler–are among the top 20 in all corporate research and development spending. Volkswagen is first, with more

than $11 billion in spending. The healthcare industry has 7 of the top 20 companies, while computer, electronics, and software companies make up the remaining 8 companies.

Key areas of Innovation

Three principal forces are driving innovation in the auto industry today: regulatory mandates with respect to fuel efficiency, emissions, and safety; consumer demand and expectations; and technological advances that enable the development of new features and reduce their cost. The result is that companies are concentrating their product-development effort in four areas: power train, lightweight materials; connectivity, and active safety and assisted driving.

1. **Power Train**

Aggressive fuel-economy and emissions regulations have focused carmakers´ efforts on two principal areas: increasing the efficiency of internal-combustion engines and developing hybrid gasoline-electric power trains. Thanks to improvements in turbocharging and direct-injection technologies, manufacturers have been able to shrink the size of ICEs without an adverse impact on power. In fact, these improvements may lead to a shift in emphasis from diesel-powered to gasoline-powered engines among European automakers in coming years.

In the marketplace, hybrids are proliferating as options, and their penetrations is increasing. Battery weight and cost, along with energy density, charging speed, and safety, have thus far constrained consumers´ acceptance of fully electric vehicles. A big shift in regulatory requirements, such as the 2030 zero-emission target in California, would be necessary to boost further market development.

2. **Lightweight materials**

The quest for greater fuel efficiency is driving more widespread use of lightweight materials, such as aluminum, magnesium, and carbon fiber. More small engines today are constructed from aluminum than from iron. The BMW i3 electric car, introduced in 2013, is constructed substantially of carbon fiber, which is one-quarter the weight of steel and five times stronger. However, carbon fiber components are up to ten times more expensive to manufacture and assemble. OEMs are therefore investing in component-manufacturing and assembly technologies that lower the cost of using carbon fiber and other lightweight materials. Just as aircraft manufacturers have moved to using composite materials to lighten the weight of newer model planes, so, too, are BMW, Volkswagen, Mercedes-Benz, and other major automakers increasingly manufacturing mass-marker cars made of lightweight materials that traditionally were reserved for so-called super cars.

3. **Connectivity**

The car and consumer electronics are converging – with far-reaching ramifications. This phenomenon, which started in the 1990s with telematics (pushed into the mainstream by pioneers such as GM) and increasingly sophisticated onboard infotainment features, is now quickly morphing into an entire ecosystem of digital technology with the vehicle as the hub. Improvements in the capabilities and cost of cameras, sensors, software, and communications are enabling real-time connections from car to car to infrastructure, car to the cloud, and car to personal devices. Adding cellular connectivity and a Wi-fi hub to a vehicle today costs less

than €50 in incremental components per vehicle. Software controls a growing number of automotive functions and features, enabling cars to communicate with manufacturers, dealers, government authorities (for example, motor vehicle departments and toll collectors), and a host of other organizations and things, such as parking structures. If and when fully autonomous driving becomes a reality, the car could increasingly become a fully connected extension of the home and office.

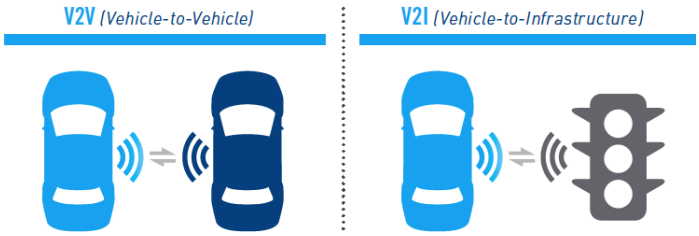

Figure 1 Communication options for vehicles

4. Active safety and assisted driving

The driverless car is no longer science fiction. Google has built it. Despite recent tests that demonstrate the superior safety of today´s autonomous cars, legal, product liability, and regulatory issues ultimately may keep the driverless car off the road in some jurisdictions. But the technologies and components that make such vehicles possible will only grow in prevalence and affect a variety of mass-market applications.

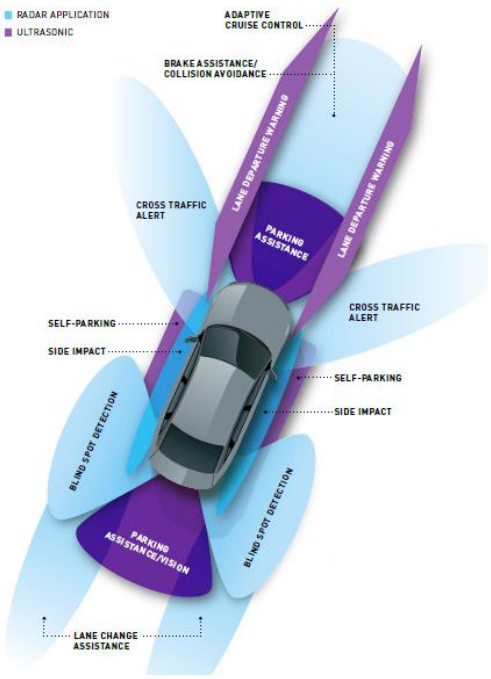

Figure 2 Advanced assistant systems

The electrification of the automobile has made it possible for previously isolated functions – steering and braking, for example – to communicate with each other. The driver is no longer a necessary link, processing feedback from one function and addressing the other accordingly. Software can perform the same job, often much more quickly and with a lower propensity for error. Software plus advances in camera, radar, and thermal technologies, as well as reductions in their costs, have given car the ability to adjust and react to other vehicles (as well as to people, animals, and moving and immovable objects) on the road.

As the car becomes more aware of its surroundings, the potential for human errors is reduced – and driver time is freed up. Imagine being stuck in traffic and engaging an (automatic cruise control” feature that lets you the morning paper (on your tablet, of course), catch up on e-mail, or work on that report due at the end of the day.

These technologies exist. The constraints to implementation lie elsewhere. It will take partnerships between governments, regulatory agencies, and manufacturers to navigate the legal and liability minefields between the laboratory and the highway. Consumer demand is real and growing, so we can expect that.

Conclusion

High-tech manufacturing methods are a trademark of the automotive industry. The automotive industry has historically been a major driver for the robotics industry, and continues to develop new ways to implement robotics systems in order to improve manufacturing precision and efficiency. The industry is also rapidly increasing its use of state-of-the-art processes and materials, such as new digital engineering and nanotechnologies to improve the design and production of vehicles.

Innovation in the automotive industry is driven by a confluence of factors that have greatly increased the need for automakers and suppliers to utilize technology to differentiate themselves from competitors while meeting increasingly stringent government regulations. Automakers use the best ideas developed around the world, as well as creating innovative processes and products Furthermore, in the search for new products and more efficient processes, the auto industry collaborates with the electronics, materials, aerospace, and other industries and well as developing entirely new technologies on its own.

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Contact address
Ing. Michal Demečko
Technical University of Kosice, Faculty of Mechanical Engineering, Department of Industrial Engineering and Management, B. Nemcovej 32, 040 01 Kosice, Slovakia
e-mail: michal.demecko@tuke.sk

doc. Ing. Jaroslava Kádárová, PhD.
Technical University of Kosice, Faculty of Mechanical Engineering, Department of Industrial Engineering and Management, B. Nemcovej 32, 040 01 Kosice, Slovakia
e-mail: jaroslava.kadarova@tuke.sk