Net Zero and the Topic in Focus for Auto Parts Industry

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Net Zero and the Automotive Industry

The concept of ACES (Autonomous, Connected, Electrified, Share & Service) was first proposed by Daimler, and has gradually become a common goal for all major automakers, not only driving the automotive industry toward high-tech development, but also creating a different business model. Toyota has announced that it will no longer manufacture and equip cars with gasoline engines after 2050, and the collaboration between Honda and GM will be expanded to a wide range of technologies. Leading Japanese automakers, including Nissan, are actively laying out and setting goals for the development of Hybrid EVs, fuel cell vehicles, self-driving vehicles, and Internet of vehicles, actively looking toward the future.

In 2030, the number of newly registered vehicles in Europe may increase by one-third to 24 million per year. In the U.S., the sales volume of new vehicles will increase by 20% to 22 million in 2030, while the sales volume in China is expected to increase by 30% to 35 million. This huge growth will necessitate additional investment in new production and development capabilities by automakers and component manufacturers, i.e., new, highly specialized vehicles at lower prices. Automotive companies and their component makers will have to make big decisions in the coming years, facing the pressure of decreased profit margins while investing significantly in new plants, electric vehicles and other megatrends.

Major Countries Push for Carbon Neutral Policies

In recent years, key words such as “climate change,” “climate crisis,” “carbon neutrality,” “carbon emissions,” and “carbon footprint” have become issues of increasing concern to global governments, international corporations, environmental organizations, and the general public. The environmental and climate issues involved are not only a risk that companies and governments must be aware of, but also a key to sustainable development, and addressing the climate crisis and carbon neutrality is becoming increasingly important. “Carbon neutral” or “net-zero carbon” means that carbon emissions and carbon reduction offset each other to achieve net-zero carbon emission. There are two ways to do so: (1) using carbon compensation to absorb the released carbon, for example, by planting more trees (2) reducing the release of carbon at source, etc., which may be a strong and powerful way to counteract the problem.

Carbon emissions come from various human activities, mainly from burning fossil fuels, which account for 70% of the greenhouse gases in the atmosphere and continue to have a profound impact on global warming. Therefore, carbon neutrality is crucial to addressing the climate crisis, with the goal of slowing down, adjusting, or even reversing the challenges of civilization’s survival under the climate crisis. To keep the global temperature rise below 1.5°C, the world must become carbon neutral by 2050 or earlier. In recent years, governments, businesses and investors around the world have been increasingly concerned with “net zero” emissions policies, seeking to accelerate decarbonization of economic entities, not only in power generation, but also in transportation, vehicles, buildings, manufacturing, and everyday life.

Several countries and regions have announced plans to achieve carbon neutrality by mid-century, including China’s announcement to achieve carbon neutrality by 2060. The EU, Canada, South Africa, Japan, South Korea, and Hong Kong have pledged to achieve carbon neutrality by 2050. The U.S. is committed to achieving carbon neutrality by 2050, and its power generation will be carbon neutral by 2035. New Zealand, Chile, Denmark, France, Hungary, and UK have further incorporated the

2050 target into law. Some countries have set more aggressive targets, such as Austria and Iceland by 2040 and Finland by 2035. With current commitments, about two-thirds of global carbon emissions and 75 percent of GDP are expected to be fully decarbonized by mid-century. **Table 1** shows the carbon neutrality policies of major countries.

Table 1: Carbon Neutral Policies of Major Countries

Item	Carbon Neutral Policies	Carbon Reduction Policies	Other Policies
UK	British Standards Institute (BSI) Carbon Neutral Standard National credit deduction quality certification	60% reduction in emissions by 2050	
Australia	Greenhouse Friendly Label (2001-2010) 2010/07:NCOS Carbon Neutrality Program	Reduce to 20% of 2000's emissions by 2020	The "Carbon Pollution Reduction Plans" trading system will be in place to control total emissions after the Kyoto Protocol.
Japan		60~80% emission reduction by 2050 Establish domestic emissions trading system, trial runs of domestic credit system	National "Low Carbon Action Plan", developing environment-related policies and technologies 2009: Draft of national carbon footprint standard
China	National-level activities to reduce emissions and achieve carbon neutrality.	The Eleventh Five-Year Plan sets target of 20% reduction in energy consumption per GDP Before the Copenhagen Conference, it was proposed to reduce emissions by 40-45% per dollar of national income by 2020. The proposed targets for the 12th Five-Year Plan are to achieve a 72% combined utilization rate of industrial solid waste and a 15% increase in resource yield.	Establishment of Clean Development Mechanism Committee to embark on CDM program. The National Forestry Administration (NFA) established the Green Carbon Fund, which provides investors with the opportunity to purchase carbon sink for acquiring credits.
U.S.	Corporate "Climate Leaders" to provide guidance on reduction and carbon neutrality.	Various emission reduction and energy conservation assistance bills More than 80% carbon reduction by 2050. 20% of electricity generation from renewable energy.	Local government agencies, universities and colleges voluntarily set carbon neutrality targets.
Norway	Set up carbon neutral projects to purchase deductible credits and invest in the development of various reduction projects in developing countries.	Sectoral emission reduction bills (e.g. residential) to achieve 30%~40% carbon reduction by 2020.	Add energy tax.

Source: Industrial Technology International Strategy Development Institute, ITRI (Mar. 2023)

Carbon Efficiency and Resource Efficiency at the Core of Net-Zero Carbon Emission Implementation in the Automotive Industry

The Circular Car Initiative (CCI), launched by the World Economic Forum, brings together 40 companies and research institutes to develop the concept of "circular car", which focuses on increasing value and efficiency, using less energy and resources to meet the mobility needs of more people. By systematically introducing new technologies, material innovations, efficient vehicle use and whole-life management, the entire automotive value chain will be rebuilt. The ultimate goal of the "circular car" is to reduce vehicle lifecycle emissions and maximize the carbon efficiency and resource efficiency of each vehicle. It is estimated that carbon efficiency and resource efficiency will be improved by 75% and 80% respectively by 2030.

Carbon efficiency is to reduce the emissions of the whole life cycle of the vehicle, and it is necessary to start from every aspect, including lightweight design, introduction of renewable energy into assembly lines, extended life of the vehicle, recycling and reuse, etc. Resource efficiency is to reduce the number of materials that cannot be recycled, and to increase the proportion of renewable materials, parts remanufacturing and materials reuse.

Net Zero and Circular Cars

The automobile industry is one of the heavy industries with high emissions. The manufacturing and use of automobiles account for about 10% of global greenhouse gas emissions and use a large amount of steel, aluminum, plastics and other high-emitting materials. With the increase of population and the middle class, it is estimated that the global transportation demand will grow by 70% in 2030. If we continue to follow the linear economy, namely the mass production and mass sale operation model, the number of vehicles and carbon emissions will grow by 70%, which is contrary to net zero.

However, by adopting the circular economy model, through sharing and recycling of parts and components, the number of vehicles will be reduced by 30% and carbon emissions will be reduced by 50%. In fact, driven by regulatory requirements and changing consumer demand, the automotive industry is embarking on a wave of circular economy transformation, prompting manufacturers to develop new operating models toward the goal of zero waste and zero emissions. The international automotive industry is using resource recycling strategies to create a net-zero blueprint, not only to reduce carbon, but also to create new business opportunities, which is also a trend that the automotive industry chain needs to grasp.

National regulations are becoming more stringent on the carbon emissions of automobiles, and the global automobile industry has been aggressively pursuing electrification. While electric vehicles reduce carbon emissions during the use phase of the vehicle, batteries increase carbon emissions during the manufacturing and end-processing phases. With the development of electrification and low-carbon energy, the recycling of vehicle materials and components is the key to achieving net-zero for vehicles. A complete assessment of a manufacturing plant's greenhouse gas emissions requires consideration of every link in the value chain, from upstream material extraction and processing, emissions from the plant's own operation process, to downstream processing after products sold, use and recycling of products sold, and other stages of emission sources that need collection and disclosure of data. In general, more than 80% of the total emissions from manufacturing plants come from the upstream and downstream value chains.

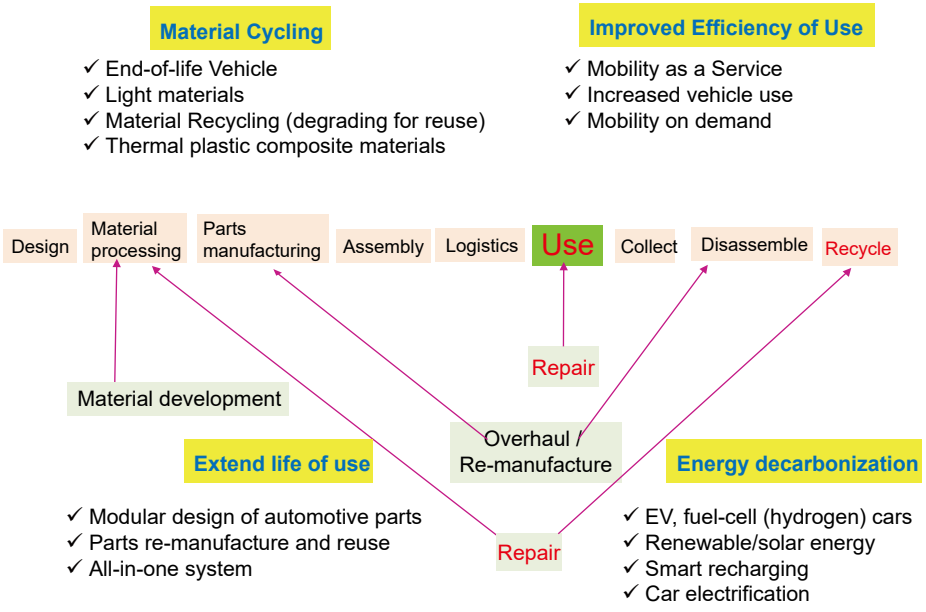
The manufacturing industry must examine the sources of emissions from the overall value chain to fully respond to carbon reduction measures, among which grasping the changing trend at the market end is an important leverage point to re-plan the low-carbon value chain. The needs and habits of car users are changing, favoring affordable, comfortable and convenient mobility solutions that are environmentally friendly, electrified and smart. Automotive manufacturers need to design supply network plans that take into account user preferences, regulations and technology development trends. If manufacturers fail to grasp the market demand and misjudge the situation to allocate R&D and focus of operation to the wrong places, they will not only lose the opportunity to create value, but also face the risk of being eliminated.

Four Transformation Paths of the "Circular Vehicle Initiative"

The four transformation paths of the "Circular Vehicle Initiative" will enable the automotive industry to shift its operational focus from production and sales to the development of mobility services. The mobility service model will provide more opportunities to offer diversified services to users because of the increased frequency of vehicle use, which may lead to frequent component replacement and software and hardware upgrades. This will enable the automotive industry to develop services as a source of revenue and fundamentally replace the linear model of mass production and mass sales. **The automotive industry needs the cooperation of the whole value chain, including R&D designers, original equipment manufacturers, material and component suppliers, mobility service providers, and recycling processors, to promote the "circular car" transformation, devoting in the four transformation paths. Figure 1** shows the circular car and net-zero carbon emission implementation approach.

a. Energy Decarbonization

The energy decarbonization path is led by vehicle manufacturers, with suppliers and recycling processors investing in low-carbon technologies, and energy suppliers and governments increasing renewable energy supply and promoting energy transition in infrastructure. Material suppliers develop new technologies to decarbonize high-emitting materials such as steel from the manufacturing process. Material suppliers and recycling processors incorporate energy efficiency measures and expand the use of renewable energy in processes and material recycling.



Source: Industrial Technology International Strategy Development Institute, ITRI (Mar. 2023)

Figure 1. Circular car and net-zero carbon emission implementation approach

Component suppliers are expanding low-carbon production solutions and renewable energy use in component manufacturing and assembly processes, replacing internal combustion engine power systems with electric and hydrogen energy to reduce carbon emissions. Energy suppliers, vehicle manufacturers and mobility service providers are working together to develop renewable energy and charging facilities.

b. Material Cycling

Material cycling needs to be led by R&D and design companies, re-designing products in modules, working with vehicle manufacturers and suppliers, prioritizing the selection of monolithic materials, using secondary or renewable materials, and reusing parts or materials from end-of-life products, and in the manufacturing process, reducing material waste and achieving complete material recycling in the value chain. Materials are recycled to eliminate the need for raw material extraction and processing emissions. The process of resource cycling, such as component remanufacturing, as well as steel, aluminum and other materials recycling, will bring new opportunities for profit.

In the use phase, vehicle repair stations give priority to remanufacturing parts. At the end of the product's service life, vehicle manufacturers, suppliers and recycling processors will work together to establish a recycling system for products and components, and improve processing technology to link with the resource cycle of the value chain and reduce resources that cannot be recycled. Initially, we can start with specific materials and let processors develop technologies to improve the quality of recycled materials.

To improve cost efficiency, upstream and downstream companies in the automotive value chain are working together to expand the scale of reverse logistics. For example, Renault has transformed its Flins factory, where new cars were originally manufactured, into a Re-Factory, inviting reverse logistics companies to move in and create a "circular ecosystem" that focuses on restoring used cars and remanufacturing parts. By matching supply and demand, parts and materials can be returned to the production line or aftermarket for reuse. For instance, BMW and recycling processors jointly established Encory Remanufacturing to focus on the logistics and recycling process of aftermarket automotive parts and components, so that remanufactured parts can be returned to BMW. Both Renault and BMW are concerned that in order to expand the scale of reuse and remanufacturing, used parts and components must be returned to the remanufacturing center, processed, and then matched with manufacturers and the use needs of service station.

c. Extending the Life of Vehicles

Extending the life of vehicles, components and materials requires close collaboration between vehicle manufacturers and after-sales service providers to implement modular design, and establish resource recycling centers to expand reuse and remanufacturing scale. With the mobility service business model, manufacturers have more incentives to extend the life of vehicles. Component manufacturing requires vehicle manufacturers and component manufacturers to integrate experience and feedback from the use, repair, and recycling of the vehicle, based on a durable, modular design that makes the vehicle easy to repair and disassemble and allows components to be refurbished or remanufactured. Automotive service stations use data analysis to predict when vehicles and components will need repair to optimize service life, and they prioritize the use of remanufactured components. Finally, at the end of product life cycle, recycling processors improve the efficiency of collection, triage, and disassembly, and return components and materials to professional processors to restore function and value.

d. Increase Utilization Rate

Mobility-as-a-Service allows each vehicle to be used to its fullest potential, increasing the mileage and average ridership over the life of the vehicle. Led by mobility service providers and supported by car manufacturers and other data service providers, car rental, subscription, and sharing models allow users to select the type of vehicle and length of rental time that meet their needs. Mobility on Demand such as cabs, Uber, Yoxi, Grab, etc., and Ride Sharing (Ride Pooling), where manufacturers design vehicles according to the purpose of use, significantly increases the utilization rate of cars.

Conclusion

In response to the 2050 net zero target, the National Development Council of Taiwan has released four pillar strategies and two pillar foundations, including the transportation sector's goal to fully electrify new vehicles sold in 2040. The Council will provide subsidies to accelerate the development and production of domestic electric vehicle products, together with process improvement and energy transformation in the manufacturing sector. Automotive OEMs and component manufacturers can use the relevant policies and learn from the practices of international leaders to plan for the transformation of electrification and devote themselves to the four transformation paths (decarbonization of energy, material cycling, extension of service life, and increase of utilization rate), so as to connect with the international community and expand business opportunities.

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