



Recent Developments in Electric Passenger Cars and Implications for Chemicals in China

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China is working on a timetable to phase out the sales of traditional fuel vehicles. This was announced by Xin Guobin, a deputy industry minister, at the China Automotive Industry Development forum in Tianjin in early September. While no specific target year was given, the government official hinted that China would join Britain and France. These countries plan to ban the sales of fuel driven vehicles by the year 2040, with the aim of reducing pollution and carbon dioxide emissions.

In our opinion, there are three main motivations for this government initiative. One is that China is indeed increasingly concerned about the environment, driven both by pollution concerns of middle class Chinese and the chance to gain prestige on the international stage. Secondly, the Chinese government may feel uneasy about the growing reliance on oil imports as domestic oil production fails to keep up with demand. Finally, China regards the ongoing shift towards electric vehicles as an opportunity to establish global technology leadership in an area in which some of the accumulated knowledge of Western

economies is no longer particularly relevant. In fact, China's BYD is already the global market leader in electric vehicles by number of units sold, and a government push for electric passenger cars may further enhance China's leadership position in this segment.

In the past, government support for electric passenger cars came mainly in the shape of subsidies. However, this turned out to be expensive and also led to widespread cheating in specific segments of electric vehicles (e.g., in passenger buses). As a consequence, the subsidies have been reduced by 20% in 2017 and will be eliminated completely by 2020. Instead, the government is utilizing a target system aimed at car producers. In 2019, electric vehicles will have to account for at least 10% of each producer's volume, which rises to 12% by 2020. In addition, China also has CAFC ("Corporate Average Fuel Consumption") targets, which force car producers to achieve a certain fuel efficiency average for their overall fleet.

The Ministry of Industry and Information Technology is considering introducing a dual-credit scheme for fuel-driven cars, which is to combine the targets for EVs and for fuel

consumption into a single number for each car producer. Furthermore, car producers failing to meet these targets will be allowed to buy credits from competitors who exceed the targets.

Hence, foreign brands including VW, Ford, Renault Nissan, BMW, and Daimler, recently established EV joint ventures or EV joint brands with Chinese JAC, ZOTYE, Dongfeng, Brilliance, and BYD respectively to tackle the challenge of the dual-credit scheme. As the Chinese EV brands are in leading positions in the Chinese market with regard to electric passenger car sales, they may help the foreign brands achieve the government targets.

Given this political environment and the past fast growth of EVs in China (about 350 000 units of electric passenger cars in 2016, +70% from 2015), it is estimated that about 1.5 million electric passenger cars will be sold in 2020, and that in 2025, at least 20% of all vehicles will be electric. This will have manifold implications for the chemicals sector in China, both negative and positive ones depending on the specific materials. Some of these are discussed below.



Opportunities in electricity generation

The electricity required by electric vehicles may be generated by any number of power sources – this may well include coal power stations. However, in order to truly achieve a positive environmental effect, environmentally friendly power sources will need to be favored. In fact, China has already reduced its coal consumption in the last few years. To achieve true zero emission of electric passenger cars, even more electricity will need to be generated from renewable resources such as wind energy and solar energy. This will create huge opportunities for chemicals such as coatings, resins and glass fibers for composites, adhesives, and electronic chemicals such as high-purity acids, silicon, high-purity gases and selected specialty chemicals.

Opportunities in charging stations

The number of recharging stations located in China is expected to increase rapidly. In spite of the reduction of recharging time and the expansion of driving range due to better batteries, there will be still a strong need for additional recharging stations. By the end of 2016, China had around 150 000 charging stations, and the target for 2017 is to build 800 000 new charging points including 100 000 public chargers and 700 000 non-public chargers, at a cost of slightly below RMB1 billion. By 2020, China aims to have one charger per electric passenger car, indicating a huge future demand.

These stations require engineering plastics including PC for housing and screen, PET or PA66 for sockets, PBT/GF for fans, long chain PA for electric lines, etc. As a consequence, producers of these materials can expect a

substantial demand increase for use in charging stations. Assuming a 20% share of plastics costs in the costs of charging stations, this market is about RMB200 million in 2017, with bigger sales to be expected in the future.

Opportunities in weight reduction

For electric passenger cars, a low weight is even more critical than for conventional cars given the current limitations regarding driving range and recharging time. Of course, this importance of weight reduction may decrease somewhat if breakthroughs on battery innovation are realized to improve the driving range to over 700 km and reduce the recharging time to less than 10 minutes. However, focusing on lighter weight will probably bring composites to body segments of electric passenger cars once economies of scale of its production are achieved. In the chassis segment, PEEK will likely replace the metal gears of gearboxes. Other engineering plastics such as PA, PBT, PET, and LCP, which are already widely established for use in the electrical and electronics segment of conventional cars, will also see a demand increase due to the larger importance of electrical parts in EVs. Compensating to some extent for the loss of various plastics applications in the combustion engine powertrain segment, thermoplastics or SMC will be utilized for the outside packing box of batteries in the electric passenger car powertrain segment.

Opportunities and challenges in temperature control

For the air conditioning, changes related to the chemicals used will come from switching from traditional air conditioning to all-electric air conditioning, including an electric heater and an electricity-driven compressor.

A problem unique to electric vehicles is to keep the battery at an optimum temperature to increase life and performance. For example, Tesla pumps an anti-freezer around the energy storage system to act as an independent cooling system.

Opportunities and challenges in lubrication

Electric passenger cars do not require oil changes as there is no oil to run the engines. However, electrical motors require some grease for the bearings inside the motor. In addition, innovated chemicals for low-viscosity lubricants will be also preferred to better unleash the full potential for battery mileage. These specialties are expected to earn premiums because of the stiff demands for them to come. So, the substantial loss in volume of chemicals sold may be compensated at least partly by higher prices for new, more advanced materials.

In the next few years, foreign car producers in China will have to substantially speed up their development work in order to adapt to the growing political and market demand for electric passenger cars. For the upstream chemicals sector, this will lead to changes in demand, with some chemicals likely to strongly benefit from the shift. Chemical producers active in the automotive sector, particularly those capable of closely cooperating with car producers, tier one suppliers, processors, and other stakeholders, should aim to establish themselves as providers of solutions for the newly emerging needs of the electric passenger car industry in order to win business. This may include an adaptation of the internal marketing organization in order to specifically focus on electric vehicles as key customer group, rather than selling isolated products to this group via isolated business units. ■