

Analysis of Electric Vehicle Development

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Abstract

Air pollution and shortage are driving the development of electric vehicles. This article will analyze the development of electric vehicles from four aspects: risks of electric vehicles, electric vehicles are emerging and solving the problem, obstacles to the development of electric vehicles and ADKAR model analysis, and finally, formulate the five steps technical roadmap for the future development of electric vehicles.

Keywords

Electric vehicles, Lithium battery for electric vehicles, Charging stations.

1. Introduction

With the development of science and technology promoting the progress of society, air pollution has become a major problem of urban pollution and is becoming more and more serious. More than 60% of the pollution sources come from gasoline and diesel vehicles (Chauhan, 2010). According to the World Health Organization, millions of people worldwide die every year from diseases caused by the penetration of diesel engine dust into the lungs (BBC news, 2018a). The world's oil resources are limited. The dependence on oil resources is increasing. Geologists predict that in the coming decades, oil resources will be in short supply. The International Energy Agency reports that the next few years will be the peak of oil energy production and then gradually decrease (Kerr, 1998).

Enterprises need to explore new development strategies according to the current external market conditions to cope with the constantly changing new business environment (White and Bruton, 2010). Electric vehicle technology has been more and more recognized by people. Therefore, electric vehicles are a substitute for diesel vehicles and gasoline vehicles to effectively reduce air pollution and oil energy consumption. The development of electric vehicles will be analyzed in the following five parts: risks of electric vehicles, electric vehicles are emerging and solving the problem, obstacles to the development of electric vehicles, ADKAR model analysis, and technology roadmap of electric vehicle development.

2. Risks of electric vehicles

The battery problem of the electric vehicle is also the main risk source of the electric vehicle. A Tesla car caught fire twice in a month due to battery (Chen, 2018). The main cause of lithium battery ignition is battery heating, but this is not a factor that can be controlled by one person (Chen, 2018). The batteries of electric vehicles and mobile phones have the same structure. Although there is only a one in a million chance that a lithium battery will ignite, it still causes concern (Wang et al., 2012).

3. Electric vehicles are emerging and solving problem

Tesla is committed to the field of electric vehicles. In 2016, a Tesla driver died in an accident while using the autopilot function in Florida, USA (Poultney, 2018). This event caused people

to discuss the autopilot function of electric vehicles. The autopilot function is the main feature of Tesla electric vehicles, and they advocate people to use autopilot function, but for the sake of people's safety, Tesla has updated the autopilot technology. When people are using the autopilot function and their hands leave the steering wheel, the autopilot function will be automatically turned off (Poultney, 2018).

4. Obstacles to the development of electric vehicles

Battery technology for electric vehicles is the first obstacle to the development of electric vehicles (Axsen et al., 2010). The battery technology of electric vehicles is a difficult problem to be solved. A perfect electric vehicle battery can make the electric vehicle travel longer and avoid the danger caused by battery explosion. The second obstacle is that there are currently not enough charging stations. Governments around the world need to provide more support for the construction of charging stations (Hawkins, 2018).

5. ADKAR Model Analysis

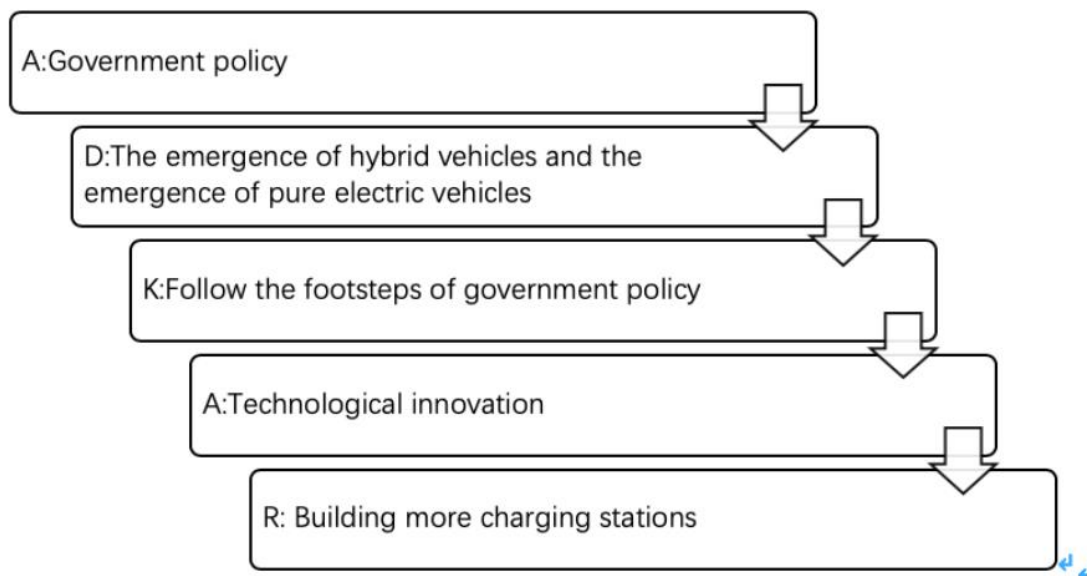


Figure 1. ADKAR model analysis of electric vehicle

In this part, the application of ADKAR model analysis is very important. The government's external management policy is a key driver of change. In 2012, the British government began to provide additional financial subsidies for people who buy hybrid cars (BBC News, 2018b). Although the British government has abolished subsidies in 2018, it has raised taxes on diesel and petrol vehicles (BBC News, 2018b). Because of the British government's policy, people are more willing to buy hybrid cars and electric vehicles when they buy cars. In addition to Britain, many countries in the world advocate people to buy hybrid and electric vehicles, such as China. Major automobile brands need to comply with the policies of various countries in the world to produce and develop hybrid vehicles and electric vehicles in large quantities.

The technological innovation of lithium batteries is the key factor to improve the ability of electric vehicles. At present, the excessive heating of lithium batteries and the explosion of lithium batteries is a difficult problem for automobile manufacturers. The solution to this problem can accelerate the popularity of electric vehicles.

With the development of electric vehicles, the need for electric vehicle charging stations is also increasing. In 2018, Tesco stores built a lot of charging stations and provided free charging service for customers who buy goods. Tesco plans to build more than 2000 more charging devices for 600 Tesco stores in the UK by 2020 (BBC News, 2018c). Strong external environment support, can make people more at ease to buy electric vehicles.

6. Technology roadmap of electric vehicle development

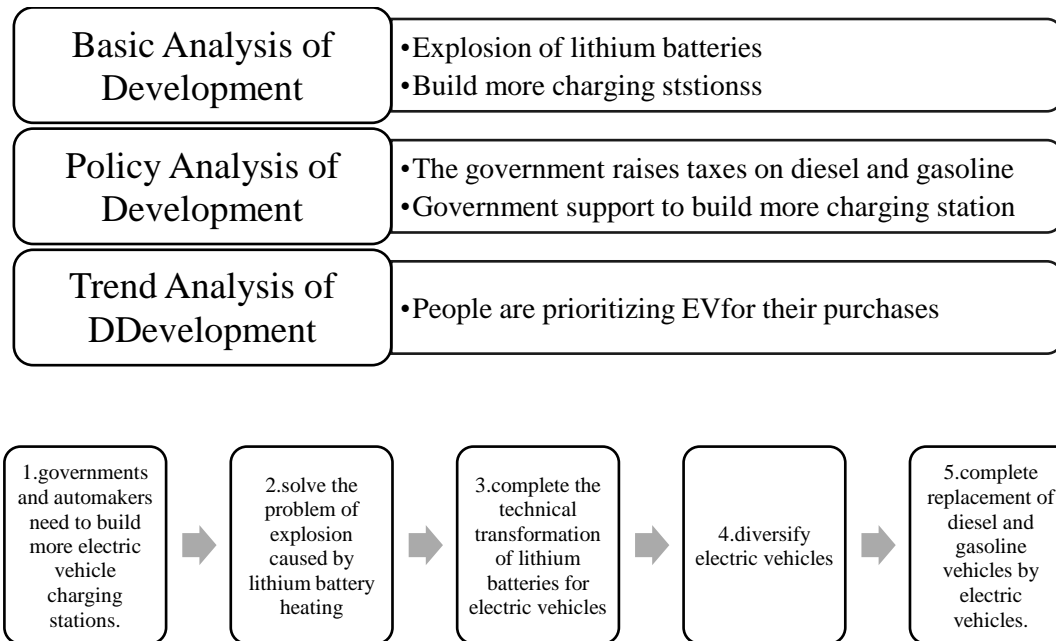


Figure 2. Technical roadmap of electric vehicle development

Through the development basic, we can face the problem of electric vehicles. Electric vehicle battery explosion caused by combustion. The lack of charging stations. These two problems must be solved in the future development of electric vehicles.

As a first step in the technology roadmap, governments and automakers need to build more electric vehicle charging stations. Governments of various countries encourage the popularization of electric vehicles, which is the driving force for the construction of electric vehicle charging stations. Second, the construction of the charging station needs to solve the problem of the explosion caused by lithium battery heating. The third step is to complete the technical transformation of lithium batteries for electric vehicles. The explosion caused by lithium battery heating is an important factor affecting people's life safety. It will directly lead to people's desire to buy electric cars. The fourth step is for electric vehicle manufacturers to produce electric vehicles at different prices. The fifth step is to replace diesel and gasoline vehicles with electric vehicles.

7. Conclusion

Electric vehicles are the future of automobiles. More governments offer preferential policies to make people choose electric vehicles. Good policies can strengthen people's determination to buy electric vehicles. It is also an urgent task to improve the management level of technology and solve the battery problems existing in electric vehicles. The effective solution to the battery problem of electric vehicles can not only reduce the hidden danger of electric vehicles but also improve the sales of

electric vehicles. More charging stations are also necessary. Finally, electric vehicles can replace gasoline vehicles and diesel vehicles.

References

- [1] Axsen, J., Kurani, K.S. and Burke, A., 2010. Are batteries ready for plug-in hybrid buyers. *Transport Policy*, 17(3), pp.173-182.
- [2] BBC News. (2018a). Madrid bans old cars to cut pollution. [online] Available at: <https://www.bbc.co.uk/news/world-europe-46403397> [Accessed 21 Dec. 2018].
- [3] BBC News. (2018b). Subsidised plug-in cars driven on fuel. [online] Available at: <https://www.bbc.co.uk/news/business-46152853> [Accessed 21 Dec. 2018].
- [4] BBC News. (2018c). Tesco plans free car charging points. [online] Available at: <https://www.bbc.co.uk/news/business-46386858> [Accessed 22 Dec. 2018].
- [5] Chauhan, A., 2010. Tree as bioindicator of automobile pollution in Dehradun City: A case study. *New York Science Journal*, 3(6), pp.88-95.
- [6] Chen, A. (2018). Electric vehicles mean first responders have to deal with battery fires. [online] *The Verge*. Available at: <https://www.theverge.com/2018/7/3/17530646/tesla-battery-fire-electric-vehicles-transportation-science> [Accessed 23 Dec. 2018].
- [7] Hawkins, J, A. (2018). Electric cars still face a big hurdle: the charging system. [online] *The Verge*. Available at: <https://www.theverge.com/2018/10/3/17933134/ev-charging-station-network-infrastructure-tesla> [Accessed 21 Dec. 2018].
- [8] Kerr, R. (1998). GEOLOGY: The Next Oil Crisis Looms Large--and Perhaps Close. *Science*, 281(5380), pp.1128-1131.
- [9] Poultney, L. (2018). Hey Tesla, how hard can it be to actually make a car. [online] *Wired.co.uk*. Available at: <https://www.wired.co.uk/article/tesla-model-3-production-stock-problems-engineering> [Accessed 2 Jan. 2019].
- [10] Wang, Q., Ping, P., Zhao, X., Chu, G., Sun, J. and Chen, C., 2012. Thermal runaway caused fire and explosion of lithium ion battery. *Journal of power sources*, 208, pp.210-224.
- [11] White, M.A. and Bruton, G.D., 2010. *The management of technology and innovation: A strategic approach*. Cengage Learning.