Analysis on Present Situation of Construction of Recycling Service Outlets for NEV Traction Battery

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Abstract. In order to promote the NEV manufacturers and the echelon using enterprises to implement the responsibility of wasted traction battery recycling, to standardize the construction of the traction battery recycling service outlets, and to improve the construction level of the traction battery recycling system, this paper studies and interprets the functional requirements of the recycling service outlets in combination with the present construction situation of the recycling service outlets, analyzes the problems existing in the construction of the recycling service outlets from the aspects of site construction and standard operation, and puts forward some specific suggestions.

1. Background of construction of traction battery recycling service outlets

1.1. Industry background
In recent years, the NEV industry and traction battery industry in China have flourished [1]. According to the statistical information website of China Association of Automobile Manufacturers (CAAM), by the end of September 2019, the cumulative output of NEVs has exceeded 3.92 million, and the cumulative number of traction batteries has exceeded 183GWh. The scale of NEV industry in China is the Top 1 in the world and shows a steady growth trend. The subsequent recycling of NEV traction battery has attracted the attention of the public. Considering the factors such as the output of NEVs in the past years, the forecast output in the future, the warranty life of battery and the operating conditions of NEV, the relevant industry research institution has predicted that by 2020, the cumulative number of decommissioned NEV traction batteries in China will be about 200,000 tons, and by 2025, the cumulative number will be about 780,000 tons. [2]

After the large-scale decommissioning of traction batteries, if these decommissioned traction batteries are not effectively recycled and disposed, the problems of safety, environment and the like are brought to the society: in the aspect of safety, the lithium ion battery belongs to the high-voltage battery, the total voltage of the lithium ion battery is still as high as 250 V when the remaining capacity is 0, which exceeds the safe voltage that the human body can bear, the personnel are prone to electric shock in the process of recycling, so there is a risk of harm to the person and the public safety; in the aspect of environmental protection, the battery electrolyte belongs to a toxic substance, and if the liquid leakage of the wasted traction battery cannot be timely handled, the battery electrolyte can cause serious environmental pollution. How to implement the NEV traction battery recycling well and
to promote the healthy and sustainable development of the NEV industry has become the hot topic of the national authorities and the public. [3]

1.2. Policy background
Ensuring the effective recycling of decommissioned traction batteries is one of the key links to solve the problems of NEV traction battery recycling [4]. Therefore, on February 26, 2018, seven ministries and commissions, including the Ministry of Industry and Information Technology, jointly issued the Tentative Administrative Rules on Traction Battery Recycling of New Energy Vehicle (hereinafter referred to as the Measures), which clearly pointed out that NEV manufacturers and echelon using enterprises should implement the Extended-Producer Responsibility System, set up recycling service outlets, recycle wasted traction batteries and transfer to comprehensive utilization enterprises in a standard manner.

According to the relevant policy documents, such as the Measures, NEV manufacturers and echelon using enterprises shall establish recycling service outlets through self-construction, co-construction or authorization to other institutions and so on methods, continuously improve the recycling service system, and take corresponding measures to promote the effective recycling of wasted traction batteries. At the same time, NEV manufacturers and echelon using enterprises shall strengthen the supervision and administration of the recycling service outlets and guarantee the recycling service outlets to normatively collect, classify, store, package and transfer the wasted traction batteries with reference to the relevant standards of the traction battery recycling industry. In addition, NEV manufacturers and echelon using enterprises shall also upload the relevant information such as battery code and battery warehousing to the "National Comprehensive Management Platform for Supervision and Traceability of NEV Recycling" in a timely, accurate and standardized manner, and complete the traceability of traction batteries, and ensure the effectiveness of traction battery recycling.

2. Present situation of construction of traction battery recycling service outlets
NEV manufacturers and echelon using enterprises are actively implementing the requirements of traction battery recycling policy, fulfilling the entity responsibility of wasted traction battery recycling, and carrying out the construction of recycling service outlets in the NEV sales area and the echelon using area of battery products. At present, the Ministry of Industry and Information Technology has published five times of traction battery recycling service outlets information through the "Public Service Platform" column of the portal. According to statistics, there are 6,975 recycling service outlets in China set up by 103 NEV manufacturers (including 4 importers) and 6 echelon using enterprises, covering 324 prefecture and higher administrative divisions in 31 provinces (cities) of the country.

The analysis on the regional distribution of recycling service outlets has found that the existing outlets are mainly concentrated in the Beijing-Tianjin-Hebei, the Yangtze River Delta and the Pearl River Delta regions with large quantity of NEVs. The decommissioned quantity of traction batteries is related to the quantity of NEVs: the larger the quantity of NEVs is, the larger the decommissioned quantity of batteries is, that is, the higher the recycling demand of wasted traction batteries is. It is suggested that the construction of recycling service outlets has taken full consideration of the actual development of NEV industry, and the layout of outlets accords with the actual situation.

The existing modes of construction of recycling service outlets mainly include the upgrading and transformation of NEV manufacturers relying on the existing after-sales service institutions, or the cooperation and co-construction with battery manufacturers, scrapped vehicles recycling and dismantling enterprises, comprehensive utilization enterprises and other enterprises. According to the analysis of the published outlet information, it is found that relying on the existing after-sales service institutions to establish recycling service outlets is the mainstream mode adopted by the current NEV manufacturers, accounting for 96.8%. The proportion of cooperation and co-construction between
NEV manufacturers and comprehensive utilization enterprises for construction of recycling service outlets is low, but the cooperation of the industrial chain has been initially realized.

3. Problems and suggestions on construction of traction battery recycling service outlets

3.1. Problems
The relevant management policies of NEV traction battery recycling in China only stipulate the construction principle of outlets in the relevant provisions of the recycling service outlets, without definite relevant details. NEV manufacturers and echelon using enterprises complete the construction of recycling service outlets according to their own practical experience and their actual situation, resulting in uneven construction quality of outlets.

The relevant enterprises are unclear to the function orientation of recycling service outlets, only pay attention to the storage of decommissioned traction batteries in the process of construction, and directly use the vehicle dealer stores as the recycling service outlets for information submission, which fails to meet the collection, packaging and transportation requirements of recycling service outlets specified in the Measures. Decommissioned traction batteries belong to hazardous goods, so they should be classified, stored and transported according to their material categories and hazard level. However, the classification links of decommissioned traction batteries are often ignored by the established recycling service outlets, and the insulation, flame retardant, heat insulation and other treatment steps of batteries are reduced, which is prone to safety accidents. Recycling service outlets need to be supported by professional safety and environmental protection facilities to ensure the safe and environmental storage, but the existing recycling service outlets are limited by site area, management cost and other factors, so they are difficult to meet the relevant requirements.

Whether the existing recycling service outlets have hidden dangers of safety and environmental protection, whether they can meet the management requirements, and whether the wasted traction batteries can be recycled effectively, are the current key problems in the traction battery recycling industry. [5]

3.2. Suggestions on site construction of outlets
The present after-sales service system is the best way to recycle the wasted traction batteries. Considering the present construction situation, the recycling service outlets can be constructed according to different requirements. Small-sized recycling service outlets can be established by selecting the after-sales service instructions and the maintenance outlets with traffic convenience to meet the temporary storage requirements of recycling process of wasted traction batteries and to ensure the effective recycling of wasted traction batteries. According to the requirements of urban and rural construction planning, ecological environmental protection and pollution prevention and control, large-sized recycling service outlets can be established by selecting the appropriate sites with complete professional facilities and equipment to meet the large-scale storage and large-scale turnover requirements of wasted traction batteries.

NEV manufacturers and echelon using enterprises should plan the construction area and quantity of their recycling service outlets as a whole and arrange the recycling system reasonably. The construction types of recycling service outlets can be determined according to the production quantity of wasted traction batteries, and the construction modes of recycling service outlets can be selected according to the regional planning of NEV sales or echelon using of battery products. For remote areas, enterprises can establish recycling service outlets using cooperation or entrustment and so on modes, and fulfill the recycling responsibility of wasted traction batteries, which, on the one hand, can save the construction and operation cost of recycling service outlets, on the other hand, can reduce the waste of resources for sharing recycling service outlets due to fewer NEVs in remote areas.

The safety and environmental protection of wasted traction batteries need to be paid great attention. When the collected wasted traction batteries have the problems of bulging, leakage and the like, the corresponding measures need to be taken for the treatment, so the waste liquid collecting devices, the
3.3. Suggestions on standardization operations in outlets

Due to the different status, material types and hazard levels of wasted traction batteries, it is very necessary to classify and manage the batteries. Wasted traction batteries should be tested in strict accordance with the relevant national standards, and can be classified into good wasted traction batteries, defective wasted traction batteries and dangerous wasted traction batteries according to the test results. In the recycling process of the three kinds of wasted traction batteries, the corresponding recycling methods should be selected according to the battery status and category, and the classified management should be carried out to ensure the safe and environmental recycling of wasted traction batteries and to reduce the burden of both enterprises and recycling service outlets.

The recycling operation of wasted traction batteries can be mainly divided into three steps: collection, storage and transfer. The recycling service outlets should compile the detailed operation manual to guide the outlet staff to carry out the recycling operation. After the classification of wasted traction batteries, measures should be taken to deal with them before storage: good wasted traction batteries can be treated by cleaning and other simple methods, and defective and dangerous wasted traction batteries should be treated with special measures such as insulation, leakage prevention, heat insulation, flame retardant and so on, so as to ensure that the storage process can meet the requirements of safety and environmental protection. In order to maximize the use of storage site space and consider the fire exposure range of wasted traction batteries, different storage methods should be adopted according to the classification results. In addition, different recycling service outlets should determine the storage time according to the classification results of wasted traction batteries: the storage time of small-sized recycling service outlets is shorter than that of large-sized recycling service outlets, and the storage time of good wasted traction batteries is shorter than that of defective and dangerous wasted traction batteries. After confirming the final enterprises of wasted traction batteries, according to the classification results and characteristics of wasted traction batteries, packaging and transportation are carried out according to the relevant national standards, so as to speed up the process of comprehensive utilization of wasted traction batteries.

4. Conclusion

Based on the present construction situation of NEV traction battery recycling service outlets in China, this paper comprehensively analyzes the problems and difficulties existing in the current construction of outlets, puts forward some corresponding suggestions on the construction steps of recycling service outlets and the standard operating rules for recycling wasted traction batteries, guides the existing recycling service system into the right track, promotes the recycling service outlets to establish and perfect the recycling management system, improves the recycling efficiency, and promotes the recycling market of decommissioned traction batteries to implement standardized management.

In addition, this paper puts forward the concept of hierarchical construction of recycling service outlets and classified management of wasted traction batteries, promotes the optimal allocation of industry resources, lightens the burden of construction and management of recycling service outlets in NEV manufacturers and echelon using enterprises, so as to reduce the recycling cost of wasted traction batteries and enhance the economic value of recycling. At the same time, this paper promotes the ecosystem formation of traction battery recycling with social, environmental and economic benefits, which is of great significance to promote the healthy and sustainable development of NEV industry in China and practice the construction of ecological civilization.
References

[1] Xu Fei. Review on Recycling of NEV Wasted Traction Batteries [J]. Henan Chemical Industry, 2017 (34): 12-15.

[2] Zhang Ting, Wang Pan, Xu Shujie. Prediction and Analysis of Traction Battery Decommissioning Amount of NEVs in China[C]. DE Stech Transactions on Computer Science and Engineering, 2018: 29116.

[3] Wang Pan, Li Longhui, Xu Shujie. Research on Management System of Traction Battery Recycling Based on Extended-Producer Responsibility System [J]. China Resources Comprehensive Utilization, 2018, 36(10): 84-86+117.

[4] He Yi, Sun Shaofeng, Jin Jing, et al. Problem Analysis and Policy Suggestions on Collection and Treatment of NEV Wasted Traction Battery [J]. Environmental Protection, 2016(10): 42-45.

[5] Dai Li. Practical Difficulties in NEV Traction Battery Recycling [J]. Energy Conservation and Environmental Protection, 2018.