



Research on the Evaluation Index System for Performance of Assuming Extended Producer Responsibility of Chinese Automotive Product Manufacturers

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Abstract. The implementation of extended producer responsibility system is an inherent requirement for accelerating the construction of ecological civilization and green, circular and low-carbon development. In recent years, China has actively implemented extended producer responsibility system in many industries; but specifically for automotive products, China has not carried out real urge and supervision on the implementation of extended producer responsibility system among production enterprises. Based on the reference to scope and content of the extended producer responsibility system implemented among foreign automotive product manufacturers and combined with the actual development of China, this paper puts forward the evaluation index system for performance of assuming extended producer responsibility of Chinese automotive product manufacturers for the reference by relevant competent authorities.

Keywords: Automotive Products · Extended Producer Responsibility · Performance Of Assuming Responsibility · Evaluation Index

1 Introduction

From the perspective of promoting the automobile production enterprises themselves and the automobile production enterprises to take the lead in actively promoting the relevant subjects to fulfill the responsibilities and obligations of automobile product recycling, this paper constructs a clear, feasible and practical performance evaluation system for automobile product producers by learning from the experience of relevant foreign laws and regulations.

2 Overview

The implementation of extended producer responsibility system is an inherent requirement for accelerating the construction of ecological civilization and green, circular and low-carbon development, which is of positive significance for promoting supply-side

structural reform and manufacturing transformation and upgrading [3]. In recent years, China has implemented extended producer responsibility system for four categories of products, including electrical appliances, automobiles, lead-acid batteries and packaging [1]. However, in terms of automotive products, there is still no effective evaluation index system for performance of assuming extended producer responsibility of automotive product manufacturers in China until now. Although many policies encouraging promotion have been introduced, its actual effect is not significant.

3 Use the Experience of Foreign Countries for Reference

In 2000, the *Directive 2000/53/EC on End-of-life Vehicles* was passed by the European Parliament. The Directive made corresponding provisions on the responsibility of automobile manufacturers to undertake the recovery and recycling of end-of-life vehicles, including the responsibility for bearing the cost for disposal of end-of-life vehicles, achieving a higher recycling rate, prohibiting the use of heavy metals, making design for recyclability, establishing coding standards and providing dismantling information. The Directive also requires member states to execute the Directive by implementing necessary laws, regulations and administrative provisions before April 21, 2002 and notify the European Commission as soon as the Directive is implemented. The EU's *Directive 2000/53/EC on End-of-life Vehicles* has become the basis for the EU member states to formulate the scrapping system. Since then, the laws and regulations on the recycling of end-of-life vehicles issued by the member states are basically transformed into the domestic laws of the member states based on the Directive, while the provisions concerning the legal responsibility of manufacturers are also roughly in line with the requirements specified in the Directives [5].

In 2002, Japan considered and passed the *Automobile Recycling Law* in the Diet. The implementation of the law has increased the responsibilities of automobile manufacturers, including: obligation on recyclable design and information provision, waste acceptance obligation, specific waste recycling obligation, account book establishment obligation, charging criteria announcement obligation and marking obligation.

In 2003, South Korea promulgated the *Act on Promoting Resource Conservation and Recycling* and the *Act on Recycling of Electrical and Electronic Waste Resources and End-of-life Vehicles*, which established the legal basis for extended producer responsibility and clarified the scope of products covered, roles and responsibilities of each part involved distribution as well as operation mechanism [2]. The Law clarifies the responsibilities of stakeholders such as producers, importers and consumers. Producers and importers must establish a Producer Responsibility Organization (PRO) engaged in recycling at their own expense to fulfill the specified recovery and recycling obligations. Producers and importers shall pay PRO on a quarterly basis for the operation of the Korean EPR system. Producers and importers are required to promote recycling by developing recycling technologies, adopting resource-efficient design, restricting the use of hazardous substances, producing and importing these products that are easily recycled, posting classified discard labels on product packaging and other measures.

To sum up, the connotation of extended producer responsibility system used for foreign automotive products includes the following contents: asking producers to bear

recycling cost, strengthening the design of recyclability, establishing the list of toxic and hazardous substances used and improving the disclosure of relevant information. The above scope and content can be used for reference in China.

4 Development Status and Problems Existing in China

At present, China's policies and regulations on the extended producer responsibility system of automotive product manufacturers mainly include *Requirements for Prohibited Substances on Automobiles* (GB/T 30512?2014), *Requirements for the Management on Hazardous Substances in Automobiles and Recyclable Rates*, *Road Vehicles - Recyclability and Recoverability - Calculation Method* (GB/T19515?2015), *Overall Plan for Ecological Civilization System Reform*, *Plan for Implementation of Extended Producer Responsibility System* and *Administrative Measures on Recycling of Scrapped Motor Vehicle* [4].

China's automobile recycling system is mainly composed of vehicle manufacturers, end-of-life vehicle recycling and dismantling enterprises and recycling enterprises. Some vehicle manufacturers in China have already begun to formulate plans for automobile recycling. However, due to relatively scattered requirements specified in policies and regulations and no upper legal basis, the mandatory binding force is insufficient, resulting in insufficient participation of vehicle manufacturers in China. In this context, the implementation of extended producer responsibility system in China's automotive industry has no obvious effect and few enterprises actually fulfill their responsibilities.

5 Construction of Evaluation Index System

5.1 Evaluation Subject and Product Range

At present, the output of the Top-100 independent legal-person vehicle manufacturers in China has reached 98% of the total output. Therefore, based on overall consideration, it is recommended that the evaluation subject is the complete vehicle manufacturer with independent legal person status specified in the *Announcement on Road Motor Vehicle Manufacturers and Products*. At the same time, automotive product importers are included.

When Chinese vehicle manufacturers carry out ecological design and other related explorations to implement the extended producer responsibility of automotive product manufacturers, they mainly focus on passenger cars and light trucks. Therefore, it is recommended to firstly evaluate the automotive products from M1-Type and N1-Type products and then expand the scope to all vehicle products in due course.

5.2 Evaluation Indexes

The extended producer responsibility system refers to a system that extends the resource and environmental responsibility of producers for their products from the production process to the full life cycle of product design, circulation consumption, recycling and waste disposal. Relevant requirements including green production, energy saving and

consumption reduction that need to be met in the production of automotive products are the relevant content that vehicle manufacturers themselves must meet. Therefore, they are not the focus of the evaluation on extended producer responsibility of automotive product manufacturers. The focuses in the scope of evaluation on extended producer responsibility of automotive product manufacturers include three links, i.e. ecological design, circulation use and recycling of automotive products, while the extended responsibility of power battery producers that should be assumed by vehicle manufacturers is also listed.

5.3 Evaluation Index System and Evaluation Method

Consider the full life cycle of automotive products, conduct in-depth analysis on the resource consumption, ecological environment and other influencing factors of automotive products at each stage from product design and production to circulation use and recycling, select relevant indicators that can be evaluated and easily verified at different stages (and assign corresponding scores to each index) and constitute the evaluation index system for performance of assuming extended producer responsibility of automotive product manufacturers. For more details, please refer to Table 1.

5.4 Evaluation Results

Vehicle manufacturers (importers included) shall evaluate their own performance of the extended producer responsibility based on the evaluation index system and evaluation method showed in Table 1. After the score is obtained, the level is determined by referring to Table 2.

Other classification methods can also be used for level setting, such as gold medal and silver medal or stars. The range of scores for different levels can be set through further research by following the principle of "most enterprises are at the level "Passed" and shall work hard to reach the level "Excellent". At the same time, the specific score of each index in the evaluation index system above can also be adjusted proportionally. Value. For example, according to the above-mentioned, when the Top-100 enterprises are evaluated, investigate and determine the score of each index in the evaluation system by the ratio of 10% excellent (10 enterprises), 80% passed (80 enterprises) and 10% failed (10 enterprises).

5.5 Evaluation Method

In recent years, the Chinese government has made great efforts to build an effective enterprise's environmental information disclosure mechanism. For example, the "Cleaner Production Promotion Law" has made a series of mandatory and incentive regulations on enterprise's environmental information disclosure. The "Measures for Disclosure of Environmental Information of Enterprises and Institutions" also stipulates specific regulations on the disclosure of information by key pollutant discharging units. In addition, the "Guidelines for Disclosure of Environmental Information of Listed Companies" also focuses on listed companies in 16 heavy polluting industries including thermal power,

Table 1. Evaluation index system for performance of assuming extended producer responsibility of automotive product manufacturers.

Link	Level-1 Index	Score	Level-2 Index	Score
Design & production (30 points)	Product design	11	Easy-recycling design	4
			Lightweight Design	4
			Eco-design enterprise	3
	Material selection	9	Content of toxic and harmful substances	4
			Use recycled raw materials	3
			Reduce the variety of materials used	2
	Parts identification and coding	6	Material identification	2
			Power battery coding	4
	Recycling rate	4	Reusability	2
			Recycling rate	2
Circulation & use (40 points)	Information disclosure	18	Disclose mandatory information	10
			Disclose targeted information	8
	Sales and repair	22	Green packaging and transportation	4
			Information release	8
			Undertake responsibility	4
			Promote re-manufactured products	6
Recycling & re-use (30 points)	End-of-life vehicles	12	Construct recycling system	6
			Achieve recycling rate	6
	Used power battery	12	Construct recycling system	6
			Achieve recycling rate	6
	Technical research	2	Technical research	2
Disposal of worthless waste	4	Disposal of worthless waste	4	

Table 2. Evaluation results.

Total score	Level
≥90 points	Excellent
60 points and <90 points	Passed
<60 points	Failed

steel, cement and electrolytic aluminum and requires the release of annual environmental reports and regular disclosure of information about pollutant emissions, environmental compliance, environmental management and others [6].

According to the evaluation index system provided in this paper, vehicle manufacturers (importers included) will conduct self-evaluation on the extended responsibility performance of automotive product manufacturers, obtain specific scores and levels, incorporate them into the enterprise's environmental information disclosure mechanism and release to the public. Then, the national competent authority entrusts a third-party credit reporting agency to verify and certify the self-evaluation of vehicle manufacturers (importers included) in performing the extended producer responsibility by using the determined verification method.

Verification and certification are made in two main aspects: first, whether the self-evaluation provided by the enterprise conforms to the evaluation method specified in the evaluation guidelines; second, whether the relevant evidence are true. Voucher information can be verified and certified by using on-site inspection, analysis of upstream and downstream and other methods; quantitative information can be verified and certified by horizontal comparison to related data; qualitative information can be verified and certified by checking relevant identification documents or reports and declaration documents; and qualification certificate information can be verified and certified through online verification with the assistance of the authorized unit that issued the qualification certificate.

5.6 Reward and Punishment Measures

If the self-evaluation of the extended producer responsibility of automotive product manufacturers is consistent with the verification results issued by the third-party credit reporting agency and vehicle manufacturers (importers included) are rated as 'Excellent', these vehicle manufacturers (importers included) are granted with relevant policy preferences, such as tax reduction and exemption, participation in government procurement.

If the self-evaluation of the extended producer responsibility of automotive product manufacturers is consistent with the verification results issued by the third-party credit reporting agency but vehicle manufacturers (importers included) are rated as 'Failed', these vehicle manufacturers (importers included) shall complete rectification within a time limit. Those manufacturers failing to rectify within the time limit or fail to meet the standard will be punished accordingly.

If the self-evaluation of the extended producer responsibility of automotive product manufacturers is not consistent with the verification results issued by the third-party credit reporting agency, these vehicle manufacturers (importers included) shall be subject to cross-departmental joint punishment and shall be restricted in many aspects including industry access, administrative approval and market supervision.

6 Conclusion

This civilization defines the evaluation subject, product scope, evaluation index system and methods, evaluation results, evaluation methods and corresponding reward and punishment measures of the repeated responsibility performance evaluation system of the producer responsibility extension system of China's automobile production enterprises, and can provide technical support for the competent government departments to formulate relevant policies.

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