

Based on Full Life Cycle Battery Green Recycling System Research of Mechanical and Electronic Products

Peng XIE ^{1,a}, Hong Mei ZHANG¹ and Li AN ¹

¹College of Science, Air Force Engineering University, Xi'an, China

Abstract. The mechanical and electronic products especially the battery bring the great convenience to our lives, but also consume a large amount of resource, and pollute environment .In this paper we analysis the problems in battery recycling and utilization in China, and point out the shortcomings as well as propose the construction of battery full life cycle green recycling system.

1. INTRODUCTION

In September 2013, the chairman Xi Jinping points out: we both keep ecological environment protection, and keep economic growth. We prefer to keep ecological environment protection, rather than economic growth, and in reality ecological environment protection is treasure. Vividly expressed government attitude and determination on ecological civilization construction.

The mechanical and electronic products especially the battery bring the great convenience to our lives, but also consume a large amount of resource, and pollute environment . Therefore construction the battery full life cycle green recycling has very important significance.

The full life cycle recycling system of mechanical and electronic products has qualities of economic and environment protection. From cycle economic view, minimizing pollution caused by discarded batteries, supplying new energy or refresh to participate the new life cycle, and forming life cycle recycling to gain maximal profits.

According to related statistics, The batteries of mechanical and electronic products in China replace 1,000,000 sets every year, if small mechanical and electrical product of test terminals including, it can reach about 2,000,000 sets. The discarded batteries contains toxic substances ,such as lead, cadmium, mercury and so on, but driven by short-term economic interests, most of discarded batteries processed by irregularly and simply ,then inevitably make negative impacts on environments.

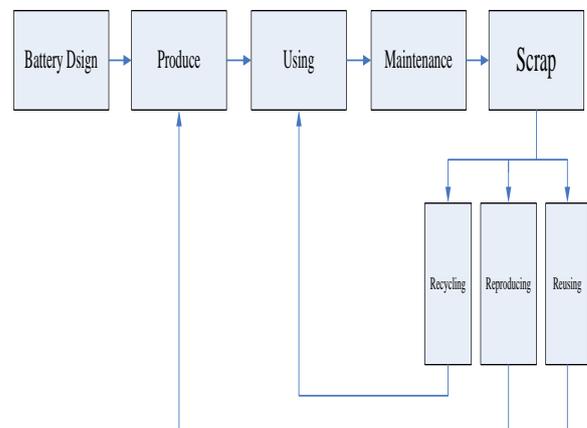


Figure 1 The Diagram of Battery Full Life Cycle

^a Corresponding author:xpf68@163.com

2. THE PROBLEMS AND REASONS IN DISCARDED BATTERIES RECYCLING

2.1 the problems in discarded batteries recycling

2.1.1 Recollecting rate is low

According to related statistics, The batteries of mechanical and electronic products in China recollecting rate is 10%.

2.1.2 The processing channels are not clear

Some discarded batteries can not find factories to process and stack for long time, which result in environment pollution risk, the other discarded batteries process difficultly due to economic, remote location, or transportation. In short, the discarded batteries hasn't process timely and efficiently, in turn affected initiative on recycling activities, and generated a vicious circle.

2.2 The negative reasons in discarded batteries recycling

2.2.1 Advertisement

On the market, The discarded batteries of mechanical and electronic products divided two types: disposable dry cell which contains toxic metals mercury, and rechargeable battery which included lead-acid battery and nicked cadmium and lithium ion battery and so on. All batteries contains toxic hazardous substances, that can enter our body in various ways, and damage the nervous system and bone after long-term accumulation.

Lacking of related risk knowledge, result in weak in recycling consciousness.

2.2.2 Not yet established a completed and effective recycling system

With inadequate recognition and weak recycling consciousness, the discarded batteries recycling still at small scale. Although few non-governmental

environmental protection organizations and individuals engaged in recycling, it is also small quantity and small scale. Comparatively speaking, the recycling quantity is a drop in the bucket, so far it hasn't form a effectively recycling networks.

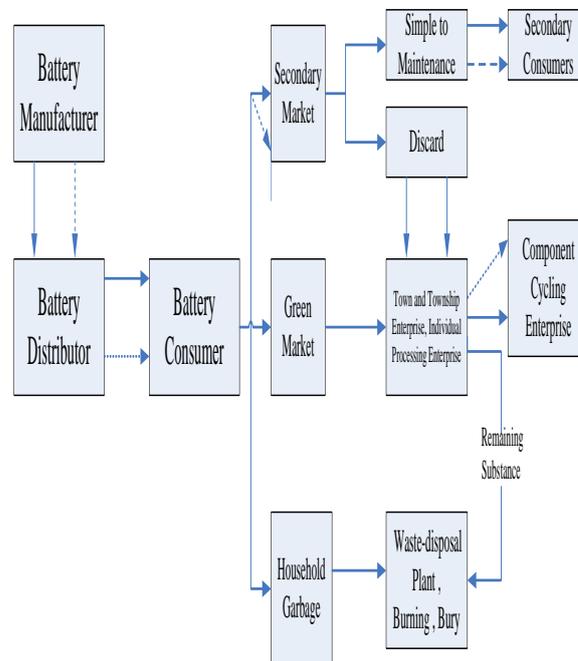


Figure 2 The Status of Waste Battery Cycling and Dispose

2.2.3 High technology, low profits, difficult to form the industrialization production

It is different to recycle discarded batteries, because of recycling process technology requirements is higher than manufacturing requirements. At present, the processing technology abroad is completed. Due to low return, long cycle time, little government subsidies, and less investors, it is unable to form industrial scale, which is one important reason of recycling difficulties.

3. THE BATTERY GREEN RECYCLING SYSTEM CONSTRUCTION OF MECHANICAL AND ELECTRONIC PRODUCTS BASED ON FULL LIFE CYCLE

3.1 Strengthen the awareness

Strengthening the ideological quality education, setting up environmental protection consciousness, and widen publicized the laws and regulation of discarded batteries by various ways such as education book, public service ads, leaflets, the mechanical and electronic enterprises must fully recognize the significant of discarded TV recycling project and recycling economic development, and carry out the expand responsibility activities, advocate cleaning production, improve discarded batteries recycling rate.

3.2 Economic and law do both

There are details about battery recycling, subsidies, provisions and penalties in American battery law and resource regeneration (RCRA). With America related laws, we could legislated relevant laws as soon as possible in China , which must be go by and observed, form virtuous cycle. The central and local governments roll out related encourage policies, which contain cleaning new resource, green economic, increasing state subsidies, supporting new emerging industry.

3.3 Strengthen discarded recycling reproducing technology and application research

Reproducing technology is a general term of technical measure and engineering activity, which guided by products full life cycle design and management, aimed for high quality, high efficiency, energy saving and environmental protection products, by the means of advanced technology and industrialized production, to repair and modify discarded batteries. By lengthen the mechanical and electrical products life, life, reduced charge time, increased recharge cycles, simply battery renew technology and other ways to increase battery service time. To Strength the battery reproducing technology research and application is increasingly important, broaden usage ways, raise battery recycling rate, and

provide supply for the development of the mechanical and electrical products recycle economic.

3.4 The implementation of mechanical and electrical products recycle design

To develop mechanical and electrical products recycle economic, on one hand, raising battery recycling rate, and on other hand reducing discarded batteries generation, which required consideration on every stage of whole period from design to usage termination. By minimizing demanding of natural resource and environment pollution, maximizing the function, to meet mechanical and electrical products optimized design. The combination of modern design and computer technology, to implement battery green design such DFR, DRD, DFE and other green design concept and method facing to usage and maintainer,

Together with economic benefit, social benefit and environment, to improve every stage of mechanical and electrical products battery full life cycle and resource utilization rate.

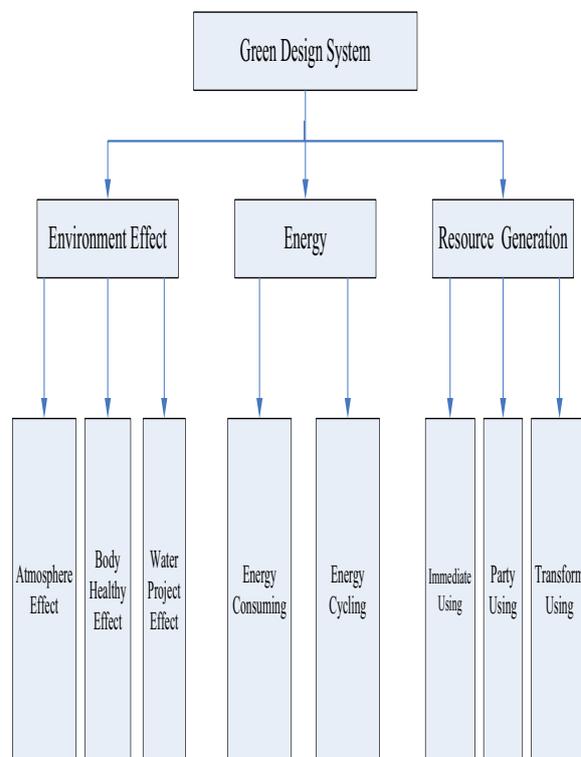


Figure 3 Green Design System

4. CONCLUSION

The recycle economic development bring social benefit and economic benefit newly, discarded battery of Mechanical and Electronic products green cycling as an important tool, it can reduce environmental destruction, increase resource utilization rate, and it is also inevitable demanding of construction of economic society and environment-friendly society .Based on full life Cycle battery green Recycling system of Mechanical and Electronic products not only promote discarded batteries recycling and reuse, but also based on the theory of cycling economic, and from controlling waste products generation in Mechanical and Electronic products generation and processing, coordinate development of economic ,society and environment.

REFERENCES

1. Charles Petzold . Microsoft C# Windows Programming (Part I; Party II). Beijing: Peking University Press(2012)
2. Jeremy Greenwood, Boyan Jovanovic. Financial Development , Growth, and The Distribution of Income[J]. Journal Economy,2013,98:1076-1107.
3. Oded Golor, Joseph Zeira. Income Distribution and Macroeconomics[J]. The Reviews of Economic Sduies,2012, 60(1):35-52.
4. Clark, George, Lixin Colin Xu, Heng Zou. Finance and Income in Inequality: Test of Alternative Theories[C]. 2013, NO.2984.
5. The measures of life cycle[J]. Industry and Environment (Chinese version). 2003(Z1).
6. WANG Zhen. The ways of romoting life cycle development[J]. Industry and Environment (Chinese version). 2003(Z1).
7. Life Cycle Assessment [J]. Toothpaste Industry. 1997(04).
8. HU Zhiyuan, ZHANG Cheng, PU Geng qiang, WANG Chengtao. Oxygen oil life cycle emission assessment[J]. Internal Combustion Engine Project.
9. XUE Feng The methods of extending life cycle [J]. Industry and Environment (Chinese version). 2003(Z1).
10. ZHANG Yaping, DENG Nan Environment policy research of products orientation.[J].Environment science and technology .2003 (04).
11. LIU Hongmei Food life cycle carbon footprint assessment research[J]. JING CHU institute and technology assessment academic journal. 2012(09).
12. PENG Xiaoyan. ISO14040 Environment management——Life cycle assessment—— Principle and frame [J].world standard and quality management 1998(04).
13. ZENG Guisheng, GUO Qin, HU Chang'an. The technology of recovered valuable metals from discarded lithium-ion [J]. Hydrometallurgy 2008(04.)
14. Li Jian, ZHAO Qian, CUI Hongxiang. The benefit analysis of discarded lithium-ion recovery[J]. China Resources Comprehensive Utilization. 2007(05) .
15. JIN Yujian, MEI Gguangjun,LI Shuyuan. The research of recovered cobalt salt from lithium ion battery positive pole in salting out method[J].Journal of environmental sciences(SCI) 2006(07.)
16. WU fang. Recovery of the cobalt and lithium from discarded lithium-ion [J] Nonferrous metals academic journal 2004(04).
17. WEN Junjie LIJian Discarded lithium-ion recycling valuable metals crafts research[J] Environment protection 2001(12).

AUTHOR: XIE Peng, Male, Born in Zhumadian City, Henan Province. Master degree, University

Lecturer. Electronic science teaching and research department of science college, Air Force Engineering University.

Research Fields: Network and data integration.