UDC 628.4.08

**Sun Xiaodong, V. Ishchenko**

# STUDY ON WASTE BATTERIES STORAGE

Vinnytsia National Technical University

***Abstract***

*Thesis analyzes methods of waste batteries storage. Different types of waste batteries are analyzed. Storage methods during transportation of waste batteries are discussed.*

**Keywords**: waste battery, storage, waste.

## Introduction

As batteries recycling facilities are being built and batteries collection schemes are being introduced, safe storage of waste batteries is a relevant task. The storage methods of waste batteries are divided into: isolated storage and separated storage. Considering the environmental pollution control and safety protection during the storage process of waste batteries, requirements have been proposed for different storage methods in terms of average storage capacity per unit area, maximum storage capacity in a single storage area, storage area spacing, channel width, wall spacing width, etc. [1].

## Results

*Waste batteries classification*

Storage methods depend on type of waste battery. According to different storage requirements and whether they belong to hazardous waste, waste batteries can be divided into ordinary waste batteries, explosive waste batteries, and hazardous waste batteries. According to the latest national hazardous waste inventory implemented by various countries, mercury containing waste, cadmium containing waste, and lead containing waste belong to hazardous waste. Therefore, waste batteries containing mercury, cadmium containing waste batteries, lead-acid waste batteries, and their scraps are classified as hazardous waste batteries. Lithium primary batteries, especially lithium thionyl chloride batteries, are prone to explosion, so these types of batteries are classified separately. Other waste batteries are classified as ordinary waste batteries.

*Storage during transportation of waste batteries*

The transportation of waste batteries should consider both environmental pollution and safety factors. The cross-border transfer of waste batteries belonging to hazardous waste should comply with the requirements of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. In China, for example, transfer of batch waste batteries should comply with the "Management Measures for Hazardous Waste Transfer Coupons" and relevant regulations [2]. During transportation, it is not allowed to discard batteries arbitrarily in the environment, and there are requirements for transportation vehicles and personnel in the standard.

For mercury containing batteries, cadmium containing batteries, lead-acid batteries, etc., they must be transported as hazardous waste. Regardless of the transportation method used, they must be transported in sealed containers to prevent leakage. During transportation, it is necessary to correctly label according to relevant requirements and use common symbols, colors, and meanings to warn of their corrosiveness and danger.

Drivers and transportation personnel should be trained: those handling hazardous waste should receive training in emergency rescue, including fire prevention, leak prevention, and how to contact emergency response personnel. In addition, they should know what type of hazardous materials they are transporting and how to handle them. Personal protective equipment should be equipped during transportation: Personal protective equipment should be provided to transportation personnel and they should also be trained on how to use this equipment in case of an accident. Transport should follow a predetermined route and schedule, and provide early warning for potential accidents or special issues that may occur during the transportation of hazardous waste.

The main problem during the transportation of waste lead-acid batteries is electrolyte leakage. These

electrolytes may leak out of waste batteries, and measures need to be taken to avoid accidents, and emergency actions should be taken in case of an accident. Transportation may cause the battery to be positioned upside down, including damage to the casing, which may cause electrolyte to flow out. Therefore, it is required to provide a sealed container that is resistant to mechanical impacts and acids. The container must be placed properly during transportation: the container should not slide. Therefore, in order to avoid this problem, it is necessary to tie it tightly and place it neatly.

*Case study of lead-acid batteries*

For primary waste batteries such as zinc manganese batteries, alkaline zinc manganese batteries, lithium primary batteries, and secondary waste batteries such as lithium-ion batteries and nickel hydrogen batteries, they are all general waste batteries. If they have not been disassembled, then they can be stored in PET plastic tanks or iron drums. Waste electrode materials, leftover materials, waste residue, etc. are in the form of scrap or slag. For convenience, they can be stored in plastic woven bags or iron barrels. Waste lead-acid batteries should first be emptied into a waste liquid collection container, and then stored in a PET plastic tank, with hazardous waste labels attached [3].

Due to the unique nature of waste lead-acid batteries, the following requirements are also applied to storage facilities:

(1) The storage point must have an acid resistant ground isolation layer to facilitate the interception and collection of any leaked liquid.

(2) There should be sufficient wastewater collection systems to collect spilled solutions.

(3) There should be only one entrance, and in general, this entrance should be closed to avoid the spread of dust.

(4) It should have an air collection and exhaust system to filter lead-containing dust in the air and recirculate the air;

(5) Suitable fire protection devices should be installed.

## Conclusion

During the storage of commonly used batteries, it is necessary to follow the standards established by each country to ensure environmental protection and safe storage in order to prepare batteries for the next step of metal recycling. The storage method depends on the type of waste battery.

## REFERENCES

1. Liu Huili. Research on the Recycling System of Waste New Energy Power Batteries. Shanghai: Shanghai Second University of Technology, 2020.

2. Zhu Lingyun, Chen Ming. Research on the reverse logistics model and recycling network of waste power batteries. China Mechanical Engineering, 2019, 30 (15): 1828-1836.

3. Wang W., Wu Y. An overview of recycling and treatment of spent LiFePO4 batteries in China. Resources, Conservation and Recycling, 2017, 127, 233-243.

***Sun Xiaodong*** – PhD student, Department of Ecology, Chemistry and Environmental Protection Technologies, Vinnytsia National Technical University, Vinnytsia, e-mail: 243660941@qq.com

***Ishchenko Vitalii*** – Ph.D., Head of the Department of Ecology, Chemistry and Environmental Protection Technologies, Vinnytsia National Technical University, Vinnytsia, e-mail: ischenko.v.a@vntu.edu.ua