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Establish guidelines for safe management of lithium batteries

# Summary

Lithium batteries are divided into small batteries used in mobile IT devices and medium and large batteries used in electric vehicles and large-capacity electric storage devices, and the market has recently grown mainly for electric vehicles. In the future, the global market is expected to grow more than 10% annually, mainly for electric vehicles, and eat into secondary battery markets such as lead acid and Ni-CD. Despite the explosive growth in the market and application of lithium batteries, related safety issues are slowly recognized.

# Background

With the advent of the fourth industrial revolution and the development of battery-related technologies, in the field of rechargeable batteries, the use of lithium batteries is increasing, replacing lead-acid batteries, which occupied most of the market in the past. Lead-acid batteries have been popular for a long time because they are easy to manage the voltage of charging and discharging, and when used in a large capacity, they are cheaper than other types of batteries.

# Discussion

As lithium batteries are newly released, many conventional lead-acid battery products have been replaced with lithium batteries. However, since there is a significant price difference, lead-acid batteries are still used when large-capacity power is required for an extended period. Unlike lead-acid batteries, lithium batteries can store high-capacity power and have a much longer battery life than lead-acid batteries. In addition, since remote monitoring and control are possible, large-scale facility operators prefer the system equipped with lithium batteries

As the supplies of lithium batteries gradually increases due to the continuous development of related technologies, the demands in various fields gradually increases; as a result, the price difference of 4-5 folds in the past has decreased to 1.5 folds. Lithium-based batteries can charge and discharge much faster than lead-acid batteries. They can store and manage much more power in the same volume; therefore, energy efficiency increases significantly.

Despite the ability to rapidly charge and discharge capability and efficiency mentioned above, the current lithium batteries often lead to fire accidents or explosions due to various reasons such as shock, high temperature, and design problems.

According to the statistics of fire incidents in Korea published by The National Fire Agency in 2021, 2% of the 1,500 storage facilities that provide Energy Storage Service (ESS) using lithium batteries reported that a fire occurred due to battery problems.

In response, the Korean government is strengthening safety management for battery storage systems as part of fire safety measures in June 2022.

The law specifies in detail the standards for manufacturing, installation, operation, management, and firefighting of rechargeable batteries and stipulates the obligations of service providers to prevent accidents.

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| A fire cause by lithium batteries | An explosion caused by lithium batteries | Fires caused by overcharged batteries |

Among the battery management regulations currently in force in Korea, important safety-related technical contents are the following two.

1. The battery must be operated based on the proven BMS/BPU.

2. Battery charging and discharging must be limited to 80% of the total battery capacity.

(*\*BMS: battery monitoring system \*BPU: Battery Protection Unit)*

By stipulating such content as a guideline in Korea, the government put much effort into expanding the use of lithium-based battery systems that have secured stability throughout the industry.

"Aid to Navigations (AtoN)" is one of the fields in that lithium-based batteries can be adopted to build an efficient system in the marine sector. AtoN mainly used light buoys, but with the development of technology, it is developing into a sensing system that can collect location information, water temperature information, and other helpful information.

Operating and maintaining these systems requires more power than ever before. A lithium-based battery system that stores high-capacity power in the existing buoy without replacing the current system is considered an alternative. In addition, since most AtoNs are located far from the land, their accessibility is very low compared to managing facilities on land.

AtoN is a tool that contributes significantly to marine safety; maintaining the system in its best condition is the most effective way to prevent potential accidents.

We are witnessing some cases upgrading AtoN systems with lithium batteries in some countries. However, in most cases, they replace lead-acid batteries with lithium batteries, and other components remain the same.

Other components and technologies should be installed to maintain the optimal condition of upgraded AtoN systems and lithium batteries.

In order to operate safely, AtoN's BMS/BPU should be configured, including components suitable for the marine environment.

1. Waterproof connector

2. Connection of power and communication functions

3. BMS/BPU for battery management/control

4. Compliance with a communication protocol for management/control

In Korea, the SMART AtoN project verifies the efficiency of the lithium battery system, and the government and industry are actively discussing various guidelines for safer operation.

IALA's existing recommendations and guidelines contain information on installing and operating a rechargeable battery system. However, there is no information on safe operations and maintenance, so we request a revision of the guidelines.

# References

1. G1067-3 ELECTRICAL ENERGY STORAGE FOR AtoN
2. Fire Safety Standards for Electic Storage Facilities(NFSC 607)
3. Article -ESS fire accidents that have occurred in the past 2 years, “cause of battery internal abnormalities”

# Action requested of the Committee

1. Input document number, to be assigned by the Committee Secretary [↑](#footnote-ref-2)
2. Leave open if uncertain [↑](#footnote-ref-3)