**Public Health Risks from Lithium-ion Batteries in the Maritime Industry**

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**Objectives:** UKHSA EHE Wales conducted a review of existing evidence of maritime lithium-ion battery (LIB) incidents, including the types and frequency of incidents, the types of vessels involved, the impacts / outcomes of incidents on public health, protective actions undertaken, any processes proposed or used around decision making for such actions. The work was undertaken as part of a European project, MANIFEST Genius, to improve response capabilities to hazardous noxious substances HNS and in recognition of the increasing drive towards net zero targets, set at government and internationally.

**Methods:** A retrospective study of maritime incidences involving LIB using maritime accident data*, was undertaken for the period from 01 January 2013 to 31 December 2023, together with a search of scientific literature for the same period. Data were extracted from seven accident databases using key words associated with LIB, and the resulting incidents were assessed for trends over time, incident type, vessels involved, and incident location. The literature search included an annotated bibliography search using a defined search question and reviewed against a number of exclusion criteria. Grey literature was also included and reviewed similarly.

* International Maritime Organisation (IMO) (1), European Maritime Safety Agency (EMSA) (2), National Oceanic and Atmospheric Administration (NOAA) (3), US Coastguard (4), Allianz (insurers) (5), UK Health security agency (UKHSA) database (CIRIS) (In-house only), and Industry Bulletins and Newsletters (6 and 7).

**Results:** 10 incidents relating to LIB were identified from the seven accident databases. Additionally, 14 abstracts and 47 grey literature articles were returned as relevant. The chronological distribution, along with details of vessel types and incident location, from the accident data bases can be seen by the graphs below.

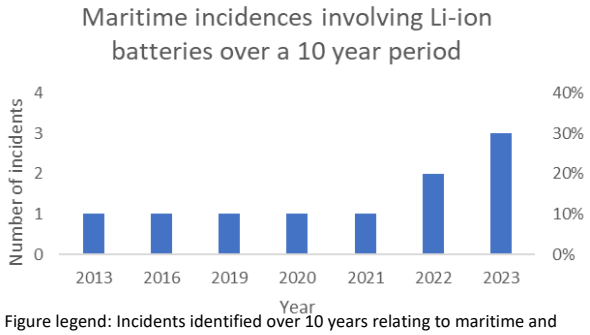


Figure legend: Incidents identified over 10 years relating to maritime and Li-ion batteries from predefined accident databases.

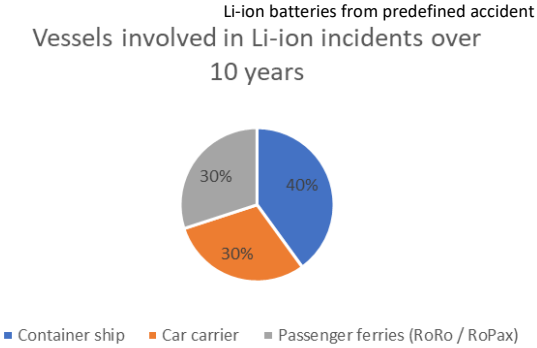


Figure legend: Incidents identified over 10 years relating to maritime and Li-ion batteries from predefined accident databases.

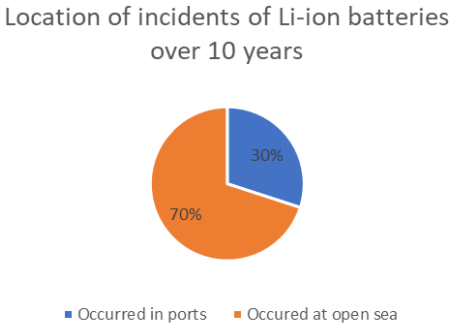


Figure legend: Incidents identified over 10 years relating to maritime and Li-ion batteries from predefined accident databases.

**Discussion:** Accident databases reported a limited number of incidents; however, numbers appear to be showing an upward trend, possibly reflecting the increasing occurrence of LIB as cargo and propulsion methods. Similar trends were also noted from review of land based incidents identified in UKHSA incident records. Findings from literature suggest, the main hazard posed by LIB is their instability which can lead to fire, explosion, and off gassing of toxic chemicals. A number of causes of instability have been defined including age and condition of LIB, level of charge and damage, as well as environmental factors including storage, temperature, humidity, and salt water. Recent incidents on car carrier ships, such as Felicity Ace (2022) and Freemantle Highway (2023) (8), are relevant examples of the impact LIB's pose.

Although current scientific literature is limited, new guidance is being developed around transport and use of LIB on ships, but little appears to relate to impact on health of passengers and responders. Long running LIB fires in ports or at sea can use existing principles of shelter, evacuation, advice but this becomes challenging on a vessel carrying passengers where such options are limited.

**Conclusion:** Based upon this study there appears to be sufficient evidence to conclude a need for raised awareness among industry, responders, and public health professionals to the potential public health hazards posed by LIBs used or carried by sea. This should include information around detection of gases, as well as guidance and training on potential health effects and protective actions for human health.

We believe this is a first review of its kind in the maritime sector.

**Acknowledgements**

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