

## **Use of ammonia in the maritime sector: possible future developments, knowledge gaps in atmospheric dispersion, and summary of recent risk studies**

Simon Gant and Mike Wardman

Health and Safety Executive, Science and Research Centre, Harpur Hill Derbyshire, UK

### **Abstract**

Anhydrous ammonia is currently produced, stored and transported in significant volumes, due to its widespread use as an agricultural fertilizer, chemical feedstock and refrigerant. In 2021, the global production capacity of ammonia was over 200 million metric tonnes<sup>1</sup>. Ship transport of ammonia is considered to be a mature technology, with vessels transporting ammonia in a liquid state (fully- or semi-refrigerated, or pressure-liquefied) between a network of ports around the world and within some inland waterways. Liquid ammonia bunkering facilities at ports range in size, with large facilities using refrigerated storage vessels with capacities of tens of thousands of tonnes.

The transport of ammonia by ship is forecast to increase significantly in the coming decades, due to both the use of ammonia as a clean energy vector and the drive to decarbonize the shipping industry. Ammonia offers some benefits over other alternative clean fuels (e.g., hydrogen, methanol) although its toxicity also presents challenges.

This future growth in use of ammonia in the maritime industry will involve new entrants to the market, some of whom may be unfamiliar with ammonia hazards. There is a need to:

- Investigate potential safety issues associated with use of ammonia in the maritime industry, including bunkering of ammonia at ports;
- Anticipate safety barriers and ensure that appropriate risk mitigation measures have been identified;
- Work collaboratively with emergency responders to analyse potential hazards and risks (including plume modelling) so that this information can be integrated into their training and emergency management plans for dealing with potential accident scenarios.

This presentation at the GMU AT&D conference will provide an overview of current international policy and industrial drivers for the growth of ammonia in the maritime sector, it will identify scientific knowledge gaps related to atmospheric dispersion of ammonia (in particular, related to ammonia spills on water) and will discuss findings from safety and risk studies around the world on maritime transport of ammonia and its storage at ports.

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<sup>1</sup> <https://www.statista.com/statistics/1065865/ammonia-production-capacity-globally/>