November 2018 www.nautinst.org

Seaways

The International Journal of The Nautical Institute

Thin ice

The NI's new book **p05**

The Nautical Institute

The plastic epidemic

Captain Naveen S Singhal MNI

Plastic bottles and trash are littering the oceans and land, poisoning the environment and humans. What we can see is just a small fraction of what's really out there. However, the warning signs are clear enough. National and international administrations and marine regulators need to act promptly to prevent this plastic menace from causing permanent damage to both the marine environment and seafarers' health.

According to a BBC report, about 8 million tonnes of plastic enter the oceans each year. If deposition continues rising at current rates, the annual total could reach 17.5 million tonnes by 2025.

In response, the European Commission has proposed a European Union-wide rule that will target the sort of single-use plastic products that are often found on beaches and in seas. It plans to roll this out before the EU elections in May 2019.

If approved, the rule will put the EU in the lead for reducing plastic waste, in line with the global implementation of the United Nations' 17 Sustainable Development Goals. Most EU members agree that regulation is urgently needed to turn the tide of plastic.

Scale of the problem

In 2016, an IMO review of the current state of knowledge regarding marine litter in wastes dumped at sea under the London Convention and Protocol stated: 'the presence of heavy litter in the deep sea is considered an index of shipping traffic, an important sea-based source' (Ramirez-Llodra *et al*, 2013). According to the report, bottles account for more than 70% of plastic litter on continental shelves.

Figures from the International Bottled Water Association show that only 23.4% of plastic bottles are recycled. The remaining 76.6% of bottles are therefore left to cause an unassessed environmental impact in an open environment.

The weight of an empty bottle is about 12.7g. If we assume a modest consumption of 24 bottles of water on a vessel per day, the plastic bottle waste generated by one merchant ship would be 305g per day or 110kg per ship per year. The estimated 50,000 SOLAS ships worldwide would therefore be responsible for 5,500 metric tonnes of plastic bottle waste a year.

The website cruisemarketwatch.com estimates approximately 26 million passengers travel annually on cruise ships. The cruise fleet of 314 vessels with 537,000 passengers at any given time could be generating an estimated 2,400 tonnes of plastic bottle waste each year. Merchant and cruise vessels combined generate approximately 7,900 metric tonnes of plastic waste from bottled water alone.

If we assume that just 5% of these water bottles are disposed of overboard, either intentionally or inadvertently, in contravention of MARPOL Annex 5, ships will be contributing 395 metric tonnes of plastic to the oceans every year. Scientists now agree that this plastic causes considerable harm to marine species that consume it, both directly and further up the food chain.

Health issues

Plastic waste has serious implications for human health too. Christiana Z Peppard PhD, professor of theology, science and ethics at Fordham University, New York City, estimates that six out of seven plastic bottles used in the USA are 'downcycled' – that is, sent somewhere out of sight and out of mind, often in less developed countries. Unregulated dumping results in plastic containers degrading and entering watercourses. Plastic debris degrades soil and deposits toxins that will affect future generations.

Even where bottles are responsibly recycled, those consuming bottled water have reason to be worried. Plastic molecules can break down and shed chemicals such as phthalates and bisphenol-A. Scientists have warned about the effects of these chemicals on human health. In water, plastic attracts other chemicals that latch on to it, including toxic industrial compounds such as polychlorinated biphenyls (PCBs).

Research results indicate that, by and large, tap water is much safer than bottled water. A study commissioned by Orb Media, a US-based non-profit organisation, tested 250 bottles of water in the United States, Brazil, China, India, Indonesia, Kenya, Lebanon, Mexico and Thailand. Plastic was identified in 93% of the samples, which included major brands such as Aqua, Aquafina, Dasani, Evian, Nestlé Pure Life and San Pellegrino. Other brands found to be contaminated with plastic included Bisleri, Epura, Gerolsteiner, Minalba and Wahaha.

The extent of risk to human health posed by such contamination remains unclear. However, some research findings indicate an increase in certain kinds of cancer, lower sperm count and increases in conditions such as autism.

Implications for shipowners

With a seafarer strength of about 25 on each cargo vessel, a company is likely to spend roughly US$10,000 per ship per year on bottled water and another $4,000 per ship per year to dispose of the empty bottles. For a fleet of 10 ships, the annual cost of purchasing and disposing of water bottles would be $140,000 – a sum that could cover the cost of conducting three interactive crew training seminars. In the next few years the cost of disposal is certain to rise sharply as more countries implement strict anti-plastic regimes.

Shipowners and managers are beginning to take steps to mitigate the risks – environmental, health and financial – associated with the use of bottled water on board.

Capt Surendra Dutt, COO of Anglo-Eastern Group, Hong Kong, says that the group is fully committed to cutting down on single-use plastic water bottles. An ongoing campaign to highlight the health and environmental hazards posed by single-use plastic is edging the group closer to the goal of a plastic-free ship. With this increased awareness at the seafarer level, Capt Dutt is confident that Anglo-Eastern can improve its environmental performance and realise its sustainability vision.

Japanese shipowner NYK has installed special filters for drinking water on board all its ships. Members of ship staff consume filtered water from designated drinking water tanks. Hemant Pathania, Managing Director and COO NYK Ship Management Pte Ltd, Singapore, believes this both ensures healthy water for crew members and contributes to a better environment by reducing plastic waste. The initiative has also produced financial savings on the procurement and disposal of plastic mineral water bottles.

John Dama, Marine Manager at offshore operator Sapura Energy in Australia, explains that bottled drinking water on offshore vessels is not only an environmental concern but also poses risks for crew. To avoid potential issues with dumping plastic bottles, the company decided to provide and improve conventional fresh water supplies from vessel systems. Regular tank cleaning and water testing were implemented. Each crew member was given a stainless steel drinking bottle that they could refill with water from the dispenser. Initially, there were fears that drinking bottles might become contaminated through contact with the water dispenser's nozzle. This was resolved by redesigning the dispenser so that it issued the water in a stream, thereby avoiding contact between the nozzle and the bottle rim and eliminating the risk of bacterial transference or infection.

Dama says the benefits of doing away with bottled water were well worth pursuing. The company was unsure how crew, clients and unions would react, but the risk paid off beyond expectations. Sapura Constructor has embraced the system as a significant environmental improvement, and seafarers' unions and Australian maritime authorities have supported the initiative.

Possible shipboard solutions

The above examples show steps that have been taken to reduce the use of bottled water on board ships. Companies looking to move in a similar direction might consider some of the following approaches.

Technical:

- Fit reverse osmosis water desalination plants on ships
- Mineralise generated water
- Ensure that the piping system from designated fresh water tanks to dispensers is in good condition (change to heat-resistant polymers)
- Regularly clean designated fresh water tanks
- Provide ships with testing kits to test water
- Post the test results each week on ships' noticeboards.

Psychological:

- Visiting office staff should lead by example by consuming the same tank water as crew members use
- Educate seafarers on the health issues and environmental damage associated with *single-use plastic* water bottles.

Regulatory:

- IMO to bring the onboard generation, storage, purification, test reports, piping system and dispensers under a regulatory scheme. This could extend to the supply of fresh water to ships by port establishments and agencies.

A regulation to curb the menace of single-use plastic bottles at the 'generation stage' – that is, the procurement and consumption of water in plastic bottles – is increasingly becoming necessary. Guidance and control measures on potable water, tanks, piping, purification, testing and dispensing would make this a robust process. This would be in the interest of seafarers' health, their wellbeing and that of the environment as well.

Shipowners are obliged to provide clean potable water, under ILO-MLC-2006, paragraph A-3.2. Most will gladly adopt these changes to reduce the financial burden of purchasing and disposing of plastic bottles. Unlike the Ballast Water Management Convention (BWM), which took many years to come into force, this should be straightforward for IMO to implement.

When introducing the BWM Convention, the urgency was to protect marine species. Now, an amendment to MARPOL Annex 5 seems essential to protect seafarers and provide them with safe, healthy and plastic-free potable water. This becomes all the more necessary since IMO is a major partner in the UNEP-Managed Global Partnership on Marine Litter. The international community looks to IMO as the leader in finding solutions to shipping-related environmental concerns and seafarer health issues.

Captain Singhal is a Marine and QHSE Consultant, GRI-certified Sustainability Consultant, Six Sigma black belt and ISO Standards Specialist