



Best ballast systems identified for safeguarding biodiversity

Ballast water used on ships is a significant source of marine pollution, with a considerable impact on marine ecosystems. A number of proven technologies to limit this pollution are available. Recent research has compared these systems and ranked them according to their costs and benefits.

Ballast water helps to keep ships stable and is usually loaded onto ships in port and then discharged in a second port while cargo is offloaded. This system means that seawater containing organisms from one region is moved to a new location. Each year about 10 billion tonnes of ballast water is transported and exchanged around the world during maritime shipping.

Proven technologies available to treat ballast water are:

- Filtration
- Cyclonic systems
- Heat treatment
- Chemical treatment
- Ultraviolet radiation
- Ultrasound
- Electroporation
- Radiolysis

The researchers used fuzzy logic – a method for evaluating large data sets – to compare these ballast water systems and determine which is best. They also considered which should have the highest priority for development and research.

Based on the benefit to cost ratio, filtration treatment offers the best combination of effective treatment and feasibility. The next two best options are the use of ultraviolet and ultrasound. All three of these options could be used to produce effective and reliable ballast water treatment with minimum cost and optimum benefits in terms of effectiveness, reliability, global benefits and safety. Two or three of these options might also be combined, to produce effective and reliable ballast water treatment with minimum cost.

The least favoured options are radiolysis and chemical treatment due to their high costs and low safety factors.

Growing awareness of the hazards of pollution of the marine environment in many countries means that there is strong demand for new and improved ballast disposal methods. Global shipping, which moves 80 per cent of the world's commodities, inadvertently transports many aquatic organisms, particularly in ballast water. The introduction of non-native species to new regions has significant ecological, economic and human health impacts. The rate of new invasions is increasing.

Preventing biodiversity loss as a result of invading alien species (IAS) is an important element of the EU's aims to halt the decline of biodiversity by 2010. In depth analysis of how IAS are introduced, and evaluation of the technologies to prevent introduction are an essential step in meeting this goal.

Source: Mamlook, R., Badran, O., Abu-Khader, M.M. *et al.* (2008). Fuzzy sets analysis for ballast water treatment systems: best available control technology. *Clean Technologies and Environmental Policy*. Doi 10.1007/s10098-007-0130-7.

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