

Drawing the line on invasive species

Controlling invasive species in ships' ballast is top of the agenda and one of the most challenging technological problems yet faced by IMO. Man's ingenuity is rising to the surface but a flexible approach is needed for the emergence of universally acceptable, viable and cost-effective ballast treatment methods

The transfer of aquatic nuisance species (ANS) in ships' ballast water is a top priority issue for the maritime industry. Environmental damage caused by such ANS transfers is said to be amongst the top four threats to the world's oceans and one of the top five United Nations environmental concerns.

In response the maritime industry, under the auspices of the International Maritime Organization (IMO), is seeking to set standards and methods for controlling the movement of ANS globally. At present the only really acceptable method of reducing the problem is by ships exchanging their water ballast at sea. However, it is recognised that this procedure has several limitations and constitutes an interim measure only.

In the race to identify alternative, more effective ballast water treatment methods, IMO has identified 40 different projects around the world, either completed or underway, aimed at developing potential new systems. Researchers are spurred on by the prospect of a potential US\$2 billion market for effective ballast water treatment systems that meet relevant performance criteria and receive international approval.

Towards a convention

At the same time IMO has been working to finalise the draft text of a new ballast water management convention for adoption at a diplomatic conference to be held in early 2004.

There is general agreement on the principles that such a convention must embody, i.e. that water carried as ballast must be treated before it is discharged elsewhere; that surveys will be required to confirm that ships are capable of achieving the necessary treatment; that certificates will be issued covering crew training in onboard procedures described in ship ballast water management plans; that penalties will be prescribed for failure to comply; and that exemptions should be allowed where treatment is unnecessary.

Unfortunately, there is still no final agreement on what international standards need to be met due, not least, to the complexity of the issue. In addition, even when the desired environmental target has been identified, the required equipment and processes to achieve it will still have to be devised and prototype-tested. Also, methods for measuring performance will need to be determined.

Traditionally, there is a strong element of compromise in most IMO conventions and, inevitably, several flag and port states will be of the opinion that more stringent requirements should have been agreed. This raises the spectre of unilateralism, especially by maritime nations and regions that may already be enforcing standards in excess of any new criteria agreed by IMO, which defeats the purpose of a harmonised international solution.

Particle size or kill rate?

The process of agreeing new standards is further complicated by the differing generic approaches that have been taken to solving the problem in recent years. For example, current US standards for ballast water treatment systems are based on a percentage efficacy, i.e. a 95 per cent kill rate, while a number of other maritime

nations, and IMO, favour a system based on maximum ANS particle size, e.g. 100 microns.

The percentage kill rate provides some assurance that most of the harmful organisms have been eradicated, but is extremely difficult to measure in practice. The regulatory authority would need to sample the water before and after the voyage. Some question the 95 kill rate criterion because, they contend, several technologies said to be capable of that standard mutate organisms or allow immature pathogens to pass the filtration device. Also, they can be adversely affected by water turbidity; or provide an environment which allows certain pathogens to multiply. These doubters advocate a 100 per cent kill standard, and point out that technologies capable of achieving this are available.

Particle size, on the other hand, is more easily measured, but the choice of maximum particle size is still open to debate. IMO has initially considered 100 microns in order to allow for the further development of new technologies and the possibility of a "best available technology" emerging. However, 100 microns would translate into a percentage effectiveness far below 95 per cent.

Dr Voight Consulting of Germany has developed the Artemia Testing System (ATS), the first surrogate test specially designed for assessing the biological efficiency of ballast water treatment options. "Although ATS is already widely known and recognised," comments Dr M Voight, "further work needs to be done. For example, the system should be calibrated against other species by setting up a sensitivity matrix and recording relevant data while carrying out full-scale tests."

Chicken and the egg

"The development of new technology is always costly, regardless of the industry," points out Parker Davis, ceo of AquaHabiStat. "When we have a situation like the current one, where ballast water treatment standards are yet to be finalised, shipowners are going to be reluctant to make a commitment. This, in turn, makes it difficult for the ballast water treatment companies to progress their work, especially when targeting customers, developing and marketing their technologies, securing finance and making the most of capital-generating opportunities."

Developers of treatment technologies are seeking more opportunities to interface with shipowners in order to adapt and engineer their methodologies for the widest range of ship types and sizes, geographical areas and operational ballast conditions. Such experience is necessary if actual shipboard conditions, including limited space, vibration, slamming, temperature conditions, high humidity and rusty pipelines, are to be properly accommodated.

Common cause

To encourage progress, calls have been made for the increased availability of public funds and more commitment from shipowners. In addition, the International Chamber of Shipping (ICS) has proposed that governments should approve the continued use of shipboard ballast water treatment systems brought into operation prior to the entry into force of a new convention, even if such systems do not fully meet whatever standards are ultimately agreed.

In the end shipowners and crews may have little control over the treatment methods they are required to use, or over the standard of purity achieved by equipment bought off the shelf. The actual standards may therefore be of less importance to owners than uniform implementation of the requirements by flag states and enforcement by port state control. This, in turn, will depend on the development of universally agreed guidelines, certificates, logbooks and related requirements that give teeth to IMO conventions.

Whatever standards are ultimately agreed, the ship's captain has the right to decide if sea conditions are safe enough for the use of ballast water exchange or the chosen treatment option, as ballast provides the vessel's stability.

Full support

"For the new IMO convention to be successful, all parties involved in the BWM issue will need to be aware of the challenges faced by their fellow participants," states Alan Taylor of Alan H Taylor & Associates Pty Ltd in Melbourne. "This need to maintain flexibility and to cater adequately for the needs of all interested parties must be recognised in the IMO work to draft a BWM convention and accompanying recommendations. Success is also dependent on all IMO signatory states accepting the IMO standards and implementing them uniformly."

In recent years the Alan Taylor team has conducted full-scale ocean ballast water exchange and heat treatment trials on the BHP Billiton-owned bulk carrier Iron Whyalla. The results of the original ocean exchange trials have been adopted as the primary basis for current IMO and several sets of national regulations governing the ocean exchange of ballast water.

In addition the Newcastle method of the verification of ballast water exchange, i.e. the Taylor Procedure, was developed and a range of other specific alternatives for ocean exchange suitable for specific ships to comply with ballast water management plans (BWMPs) were investigated by the consultancy.

Flexibility rules

"The initiative at IMO will also need to recognise that each ship should be treated individually and that each ship requires its own specific BWMP developed to suit the most appropriate treatment option allowable under the IMO regime," continues Alan Taylor.

"Consideration of the available technologies and the selection of the most appropriate treatment option will require an understanding of marine biology, naval architecture, marine engineering and the technologies available. Also, factors such as ballast volumes, pumping velocities, times available for treatment, regulatory standards and ship design need to be weighed up. The most appropriate option will invariably be the one that is the simplest and most cost-effective to implement, providing it meets the IMO criteria."

As part of this mutual acceptance, ships and the ports they visit will need to be in harmony. "The ballast treatment option chosen for a ship will have to be acceptable to all the port administrations that the ship will visit," concludes Alan Taylor. "Another challenge will be for the ballast water receiving port's administration to have a port BWMP incorporated within their environmental management plan. This will inform shipowners what is required when their ships visit different ports."