

# Factors affecting choice of ballast water treatment systems



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**From the moment the Ballast Water Management Convention was adopted in 2004, shipowners have been well aware that at some point they would need to fit a ballast treatment system to new and existing vessels unless the ship in question was to be scrapped before the implementation date.**

Some others would have been aware of the possibility that an exemption might be possible under the Same Risk Area rules but will have been frustrated to see little official action in this regard. Because of the different regulatory regimes, owners that trade to the US will already have been obliged to fit ballast treatment systems but the number of such ships represents only around 10% of the world fleet.

Even taking into account the unexpected extension allowed by the IMO in 2017, it is now time for their owners to consider choosing a system and take account of the many factors that will influence the final choice.

With such a wide choice of systems and technologies there is almost certainly a system available that could be fitted to any vessel affected under the IMO Convention or the US regulations.

However, not every system is suitable for every ship and owners must bear in mind several factors when looking for a system. Which factors are most important will vary depending upon the individual circumstances of both the owner and the ship. For some owners, mere compliance with the rules will be sufficient regardless of whether or not the system chosen is best matched to his particular needs. For others, a much more considered approach will be to look at the whole life cost of the system and its reliability.

Most systems will be sold as complete packages but it should be recognised that many of the individual components will almost certainly be sourced from sub-suppliers. There should not be much difficulty in replacing simple components such as piping unless the pipe profile is unusual and designed to be a key element of the disinfection process.

UV lamps, power supplies and rectifiers, automation control panels and other parts may however be more difficult to replace and although it may not be top of the list of concerns, potential purchasers of systems may be wise to undertake some investigation into the background of suppliers and their service and supply network. This is especially important for systems with US type approval as each component is considered as being part of the type approval. If spare parts become unavailable, the approval status may be in jeopardy.

## Capex and Opex

As with any new equipment cost will feature high on the list with upfront capital expenditure likely to be prominent for most operators. Very few makers quote list prices so there is a large degree of shopping around to be done. Most attempts to establish a typical system price will fail because of the wide range of sizes needed by different ship types and because of the different technologies used. The cost range has been said to be between \$500,000 and \$5m but with so many players in the market, competition may well reduce those figures although installation costs could be inflated for supply and demand reasons especially in the early retrofit era.

Fleet operators with many vessels could well be able to negotiate deals for multi-ship installations but factors such as ship type and ballast capacities may mean that a single manufacturer does not have suitable systems for all vessels in a fleet. In the case of newbuildings, prices will tend to be relatively small compared to the final ship price especially if the ship has been designed with installation of a particular system in mind.

In a retrofit situation, the capital cost may be similar but installation costs higher due to modifications needed to other systems in order to create space for the treatment system.

Operating costs also have to be considered. Regardless of the method of disinfectant all systems will require pumps just as they always have. In newbuilds the pumps will be matched to the system requirements from the outset. On existing ships it may be possible to reuse the original ballast pumps to save some of the cost but if the pumps cannot maintain the flow rate demanded by the new system or are deficient in some other way they may have to be replaced. The opportunity to explore more efficient alternatives to old pumps that will save running costs should not be overlooked Power costs are likely to be highest on systems that employ electrolysis or related technologies.

Considering that the systems could well be operating alongside when the ship is relying on harbour generators the power demand may need to be given a lot of thought. Across the whole

range of systems, the power required to treat a ballast flow of 1,000m<sup>3</sup>/h varies from just a few kW to over 200kW. Most fall within a band from 50kW to 150kW. For UV systems, the cost of replacement lamps may be a small additional outlay over the life of the system and it is the cost of power for the lamps that is likely to be the biggest running cost.

The costs of consumables for systems that use chemicals for treatment and neutralisation on discharge are likely to be higher than any power requirements those systems may have. For those that make use of electrochemical or similar methods, the anodes and cathodes will need replacement at some point. In systems that include a filtration step, replacement filter elements also have to be factored in to cost calculations. In all systems service and maintenance time is also a factor to consider.

Costs will be dependent on the number of ballasting and de-ballasting operations that are performed. Ships which make small numbers of long voyages will be using the system less than those which run on numerous short voyages.

The issue of cost will be tied in with the value of the vessel in the S&P market. Few potential buyers will want to pay the full asking price for a ship that has no ballast treatment system unless they intend to operate it exclusively in a SRA or if there are shore-based reception and treatment facilities available.

## **Hidden hazards**

Although ballast systems would not ordinarily appear to present many risks, several of the various treatments available can potentially cause problems if the system malfunctions. Systems relying on electrolysis or Electrochlorination will produce hydrogen and chlorine gases as part of the treatment process.

Although the systems are designed to safely deal with these gases some very unusual circumstances might arise under which levels might become elevated. The type approval process should be robust enough to identify such risks at the design stage and make provision to prevent a problem arising under normal circumstances. This is now a requirement under the new G8 type-approval guideline.

Even so it might be a prudent measure for gas detection devices to be made available for monitoring machinery spaces and for crew obliged to enter ballast tanks or void spaces which might be affected by leaks from the ballast tank. Some ship types such as tankers may present problems of their own but several manufacturers have recognised this and are producing explosion-proof versions of their systems. An owner requiring an explosion-proof system will find that there are sufficient models available to be able to select from a number of different technologies.

# Area of operation

There are two factors to be considered here; the need for a system to be installed and the water qualities likely to be encountered. There is little doubt that eventually all ships will be subject to ballast water treatment regulations but presently the only major area with a regulation in force is the US. Under the US rules both US-flagged ships and foreign vessels trading in US waters need to be fitted with a ballast treatment system unless they come under one of the few exemptions allowed.

Now that the US has type-approved a number of systems with more expected soon, the AMS rule that permitted some IMO type-approved systems to be installed will eventually be discontinued. New installations of systems under AMS are still considered by USCG as an acceptable method of complying with the regulations – but only if it has been determined that a USCG type-approved system is not appropriate for the particular vessel.

From a practical point of view the salinity of the water taken for ballast and its temperature may cause problems for some systems particularly those making use of electrolysis or certain chemicals. Ships trading worldwide may face different problems at any number of ports so no system may be better than any other, but for ships with a more confined operational range it is sensible to ensure that the system is capable of functioning correctly under the environmental conditions likely to be encountered.

Ships that make very short voyages may find that a UV system which treats ballast during the ballasting operation is a better alternative than one which requires a long tank holding time for chemical treatment to be effective. The question of organism regrowth in vessels on long voyages is one that also needs to be considered.

## Installation programme

Each year of delay in the ratification process of the IMO Convention has added thousands of vessels to the 60,000 or so that would have been obliged to retrofit a treatment system under the initially intended programme. However, the possibility of regional exemptions and containerised and shore-based treatment system does mean that an as yet unknown number of ships will be removed from the fleet needing to be retrofitted.

Owners will need to ensure that once the need arises they can arrange to have a system fitted within the timespan allocated to vessels. Some system makers claim that their products can be fitted in very short time spans but a prudent owner may do well to consider planning an installation schedule sooner rather than later because of the pressure on drydock or yard slots.

Even those system makers who claim a quick installation is possible are often talking about a period of around 10 to 14 days. Such a time span is in excess of the usual time needed for a

periodic dry docking therefore it may not be possible to install a system during the time when a vessel will be out of service.

Some manufacturers have said that initial work can be done by riding squads. However all this may well be true the men who would make up such riding squads are most likely to be needed to be working on ships in dry dock.

## **Size and space matter**

Not all systems are suited to every vessel type because of limitations on rate of treatment. Large tankers and bulk carriers commonly take ballast at rates in excess of 6,000m<sup>3</sup> per hour and there are a limited number of approved systems that can meet this requirement.

Installing multiple systems may be an answer and would provide some degree of redundancy in the event of system failure. In retrofit situations the issue of pressure drop also needs consideration.

Space on board ships is normally at a premium and while it should be relatively simple to design for the installation of ballast treatment systems on newbuilds, there could be real problems in retrofit situations. Some manufacturers have been very innovative in limiting the space requirements of their systems and allowing for a variety of configurations of component parts, in some instances it is even possible to house the system on deck or at any convenient location in the ship. Consequently, the footprints of systems with similar capacities can vary enormously and for older and smaller vessels can preclude some systems. Explosion proof versions of some systems have been developed especially for extra flexibility of location on tankers and gas carriers.

When calculating space for the system itself thought may need to be given both to access for maintenance and storage space for any chemicals used in the treatment process. Some of the containerised versions are so designed that the skid-mounted components need to be pulled from the container for servicing.