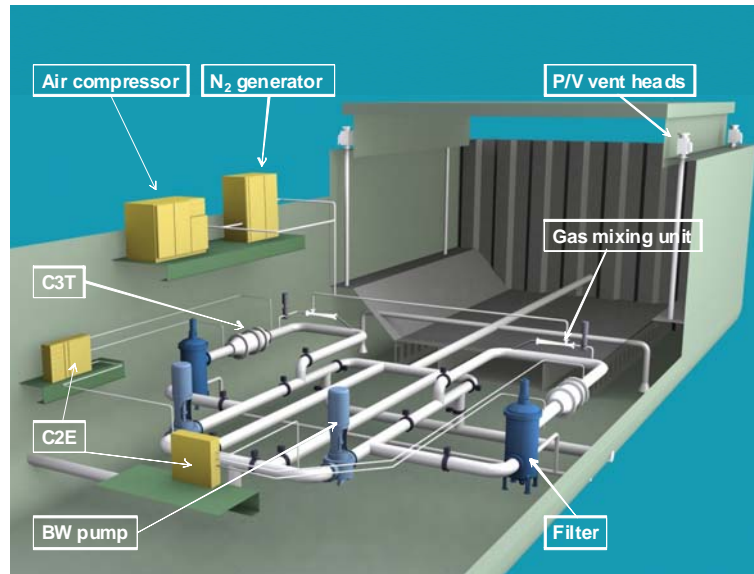


## OceanSaver® Ballast Water Management System - General Description

The system is based on the principles of cavitation and nitrogen supersaturation in addition to pre-filtration and disinfection.

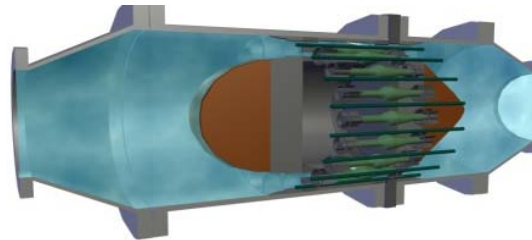
### Short process description

Ballast water is pumped onboard by the ballast pumps and filtered by a mechanical, fully automatic back-flushing filter. The water is in the next step exposed to cavitation in a Closed Circuit Cavitation (C3T™) unit before being supersaturated by nitrogen in conjunction with the injection of an in-line produced disinfectant (C2E™).



### C3T™

The C3T™ unit is integrated into the main ballast line after the filter and generates high implosion pressure pulses at very high frequencies which have an immediate effect on most all organisms. The Filter and the C3T™ unit are the only units needed to be installed in line with the ballast line.



### Nitrogen supersaturation

Nitrogen supersaturation has an effect on particularly larger organisms – caused by high level of nitrogen and oxygen deficiency – and has a good effect on preventing re-growth.

Nitrogen is produced onboard by means of a Nitrogen generator driven by an air compressor. Both these units may be installed remotely from the ballast line - in any suitable area onboard – by connecting with small diameter piping and el. power cable. The steering gear room is one option suitable for location of these units as well as compressor room when applicable. The compressor has the potential to serve also as working air compressor and the nitrogen generator may be used for other application when required as well.

### Disinfection by the C2E™ system

A disinfectant is produced in an electrodiolytic process known as water activation. This is undertaken by a unit called C2E™. Only about 1.5% of the total ballast water flow is fed through the C2E™ unit and thereafter injected into the main flow. The C2E™ unit can also be located remotely from the ballast line by connecting with small diameter piping and el. Power cable.

The footprint of the C2E™ unit is marginal. The electrodiolytic process is dependent upon a certain salinity level, but in cases where vessels are operating in brackish or low salinity waters (e.g. river water) this is arranged by using the aft peak tank (or any other suitable tank) as a storage tank for normal seawater used to feed the C2E™ unit.

### Treatment at uptake / discharge

The ballast water is fully treated at uptake as described above.

At discharge, the water is pumped out of the vessel, through the filter and the C3T™ unit.

### Pressure conditions

Most Ballast Water Management Systems will create a back pressure / pressure drop. How much will vary from maker to maker but expected in the range of 2,0 - 4,5 bar. This equals a demand of some 20 - 45 meter additional delivery head for the ballast pumps. (OceanSaver creates a pressure loss which must be compensated with increased pump delivery head of some 25 - 35 meter, depending on the draft of the vessel and the vertical location of C3T™).

## IMO Regulations in conflict?

Two completely separate IMO Regulations have been adopted the last years.

- *The Performance Standard for Protective Coatings (PSPC)* defines the system and application of coatings at new buildings with the intention to prevent rapid corrosion and provide a 15-year lifetime of the coating system selected.
- *The International Convention for the Control and Management of Ships Ballast Water & Sediments (The Convention)* is adopted with the intention to neutralise “invasive species” transported in ballast tanks from one part of the world to another

The two IMO Regulations make no reference to each other!

There are a number of technical solutions for Ballast Water Management entering the market. All solutions will make changes to the environment in the ballast tanks, some more than others. Few have taken PSPC seriously.

A ship-owner will pay a higher price for a vessel delivered in compliance with PSPC and thereby get a 15 year coating scheme applied. The same ship needs to have an approved ballast water management system installed. Unless being careful in selection of BWM system, the ship-owner may face challenges with potential damages in the ballast tank coating system applied.

Knowing the cost of refurbishing / repair of coating systems in ballast tanks, it is well worth sharing concerns why some owners choose to be careless about these matters. If it is an owner with a short time ownership like 3 – 8 years, it can be understandable, but an owner that traditionally has long term ownership (25 – 30 years) should think twice when selecting a Ballast Water Treatment System for his ships.

OceanSaver is proven fully compatible with PSPC. Long duration corrosion tests have been carried showing that the system reduces corrosion in ballast tanks and is expected to extend the lifetime of ballast tank steel structure and coating systems.



**OceanSaver AS**  
P.O.Box 2087,  
NO-3003 Drammen, Norway

**Visiting adr.:** Hans Kiærs gate 1D,  
NO-3041 DRammen, Norway

**Phone:** +47 32 88 25 00  
**Fax:** +47 32 88 25 25  
[www.oceansaver.com](http://www.oceansaver.com)  
[post@oceansaver.com](mailto:post@oceansaver.com)