Ballast Water Management

11th ERVO Annual Meeting on the 13th-15th May COPENHAGEN



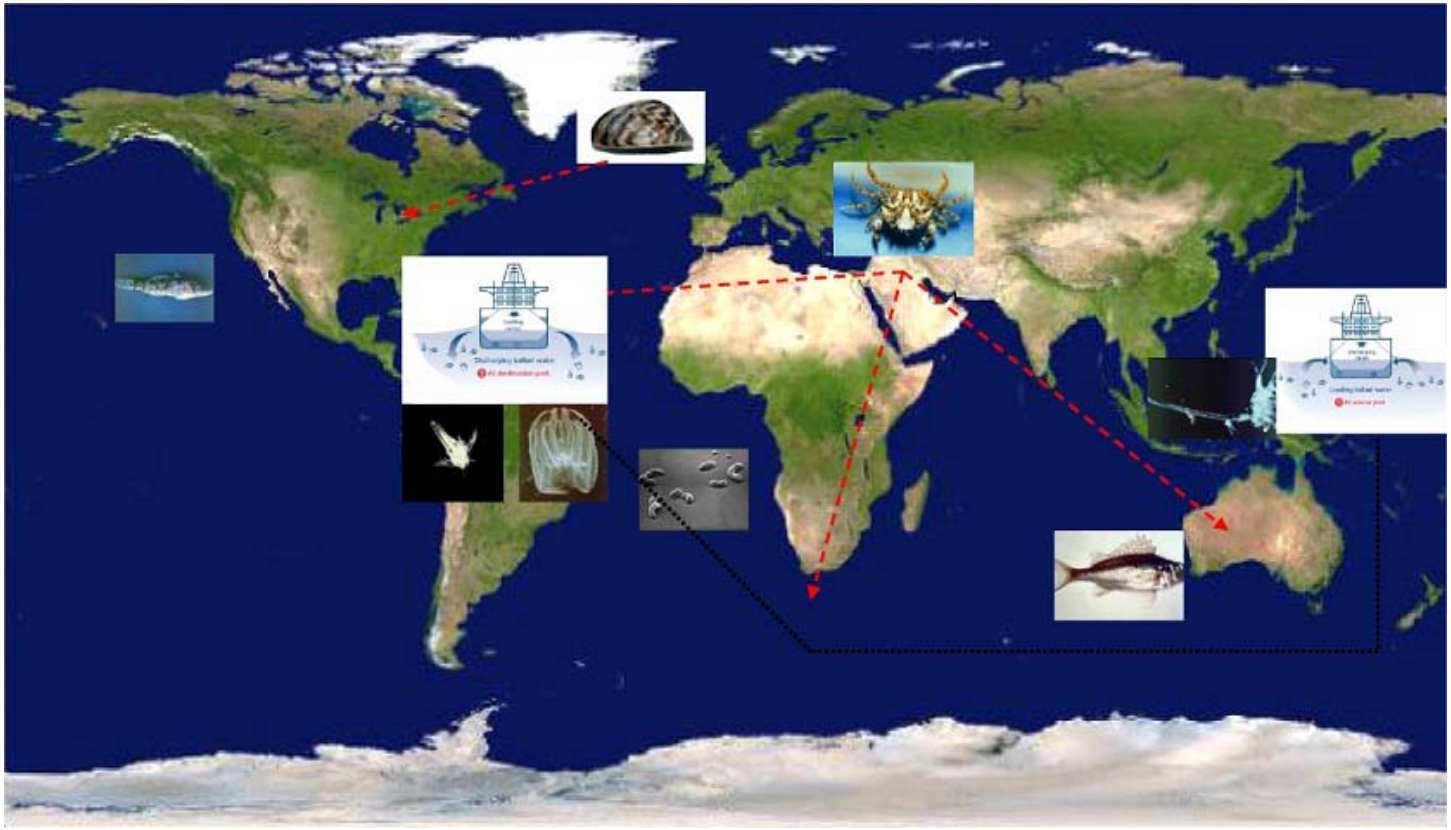


Ballast Water Management

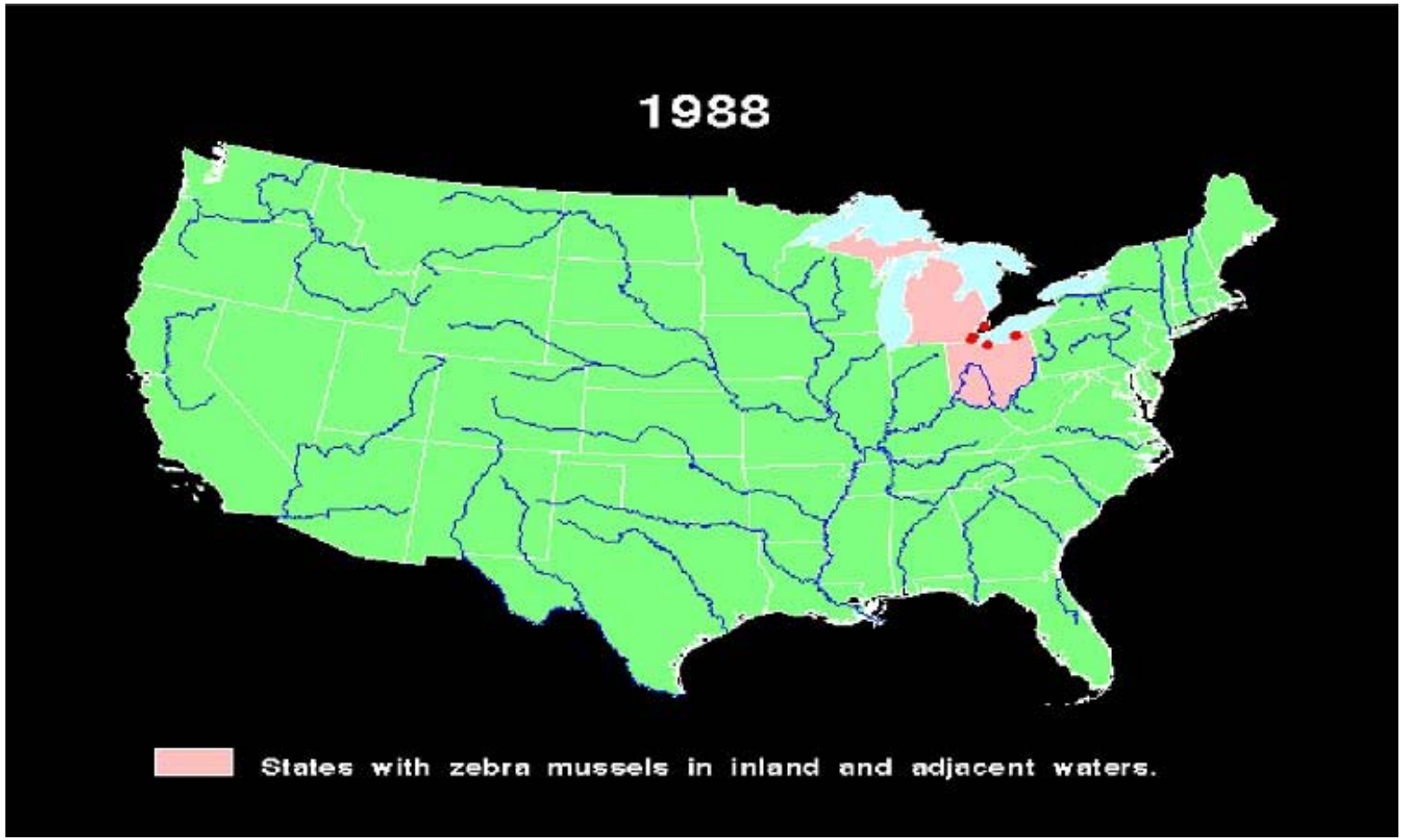
An introduction to Ballast Water Management

- ✓ **Problems - Reasons of Ballast Water Management**
- ✓ **Different methods of managing**
- ✓ **Conclusion**

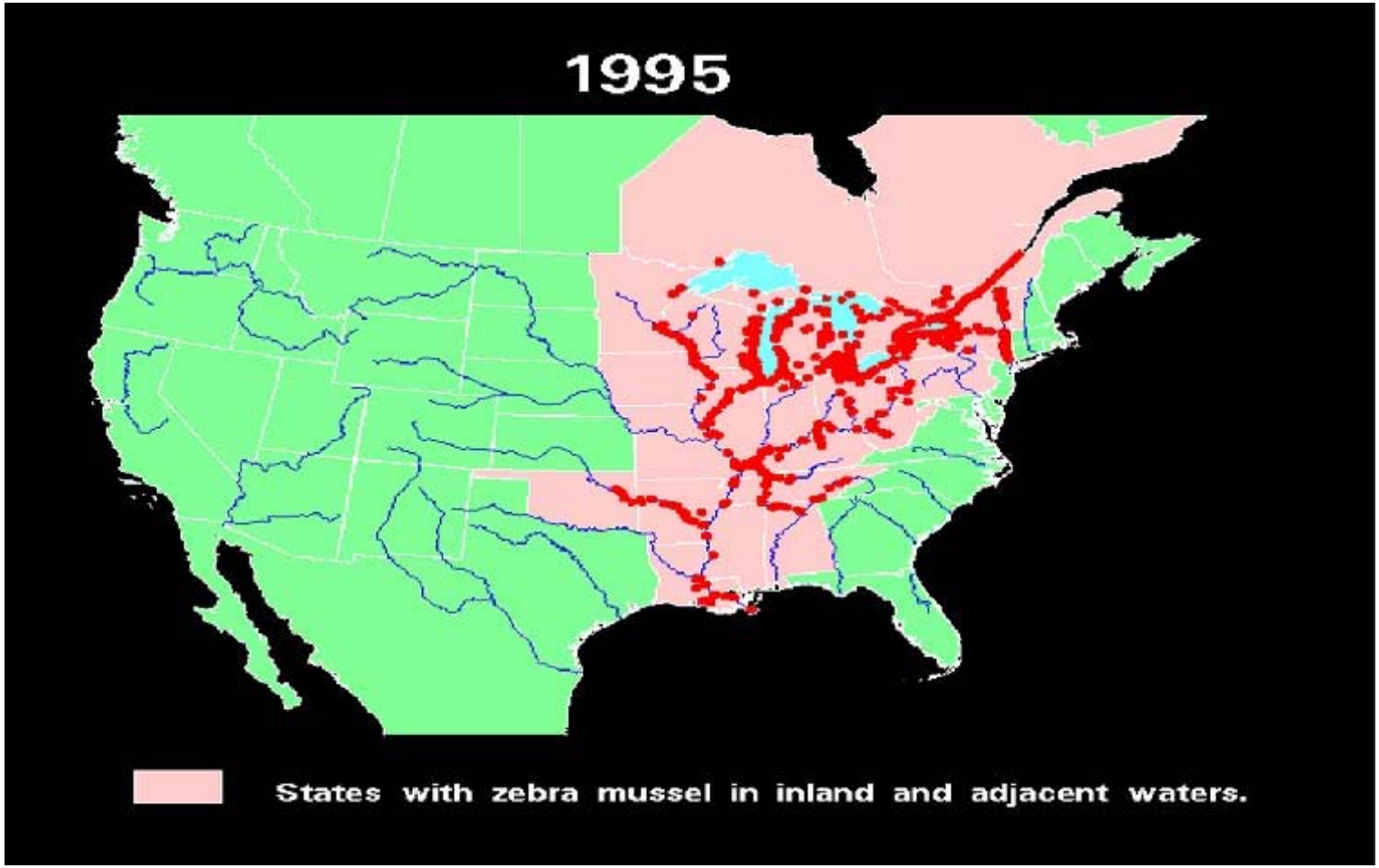
What is the problem?



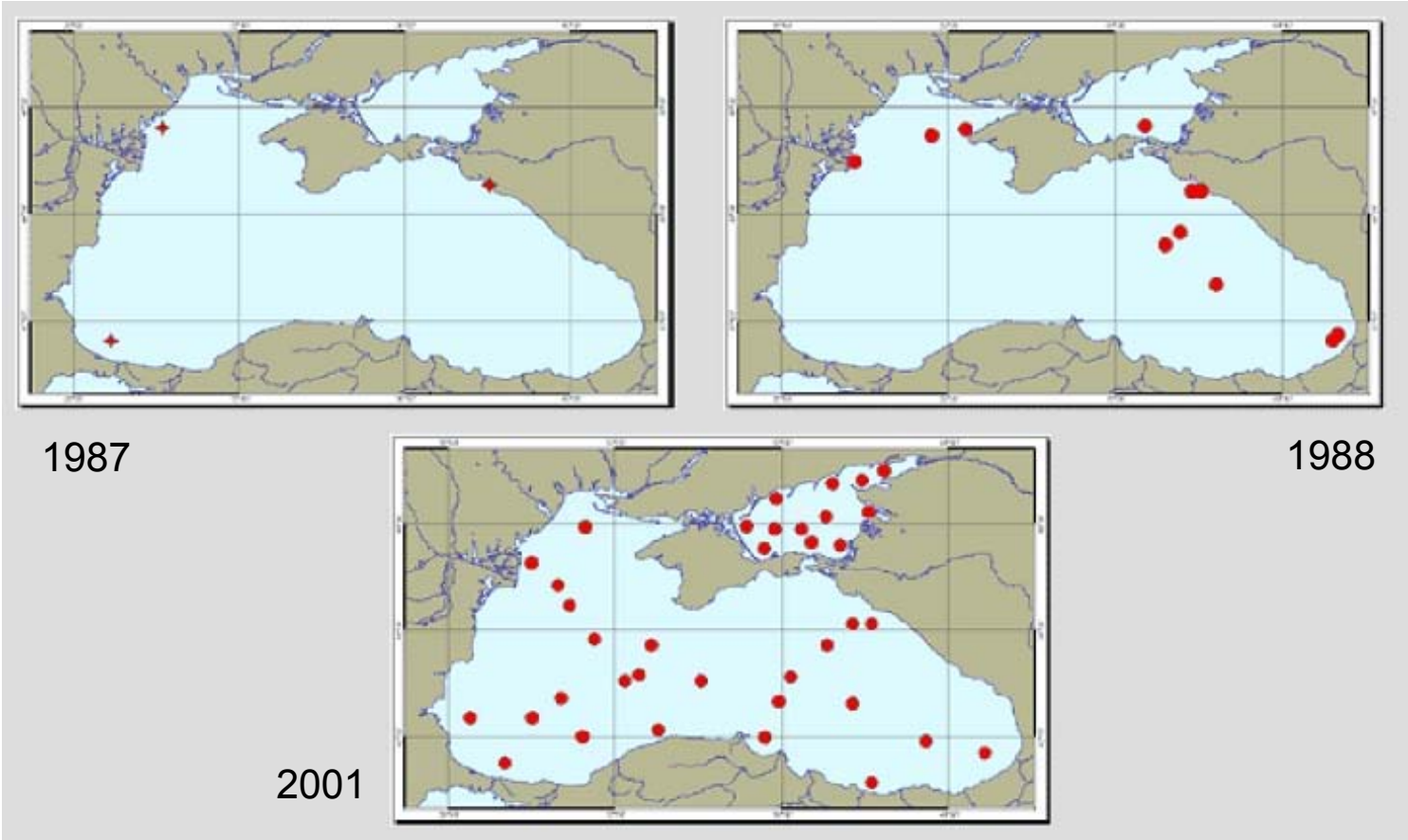
Zebra Mussels 1988



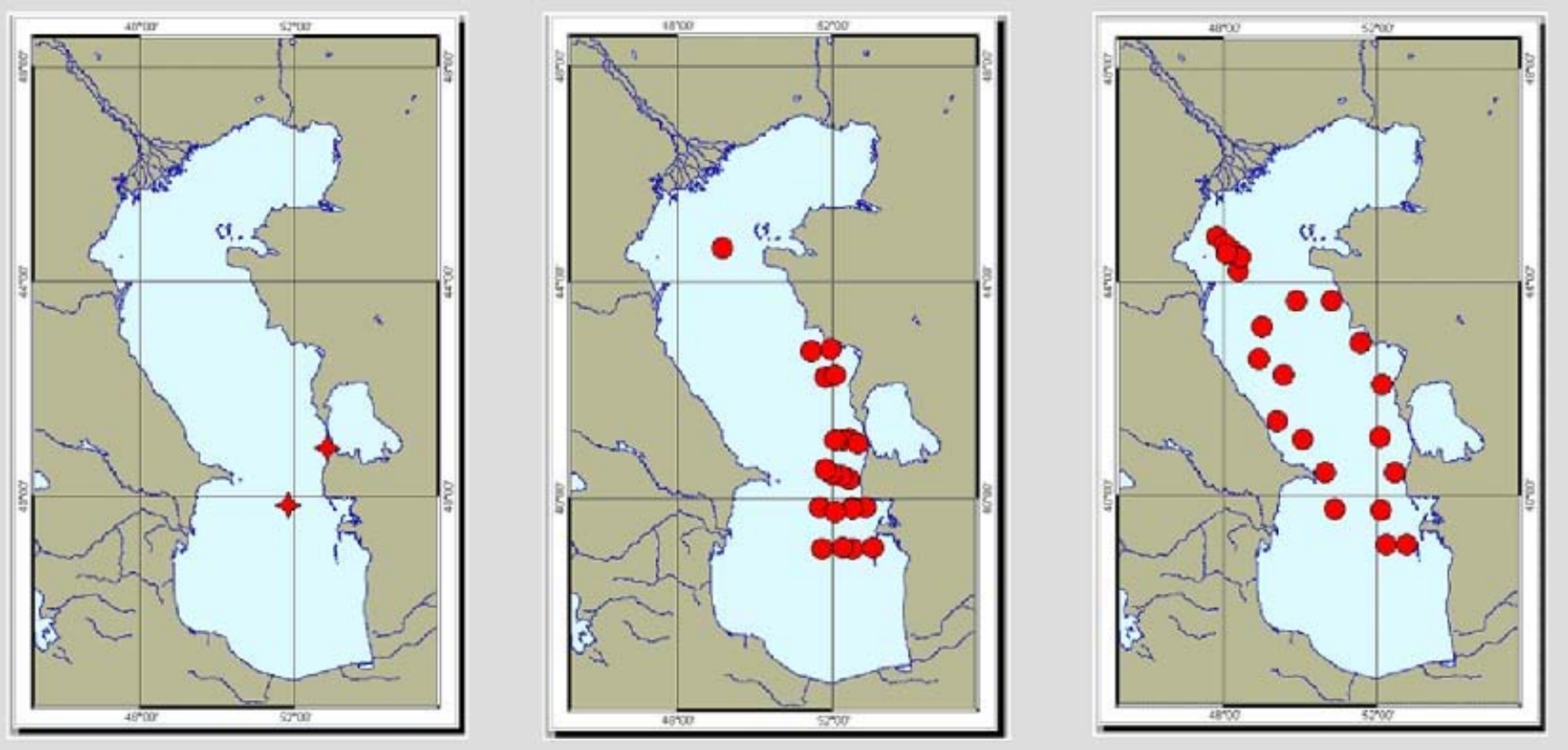
Zebra Mussels 1995



Circulation of the combjelly in the black sea



Circulation of combjelly in the Caspian Sea



1999 2000 2001

Why have a ballast water convention?

- The effects of unwanted organism has been known for a considerable time
- National authorities are requested already BMW for ships prior entering their ports, ie. USA, Canada, Chile, Australia…etc.
- November 1997 Introduction of IMO Resolution A. 868 (20) „Guidelines for the control and management of ships ballast water to minimize the transfer of harmful aquatic organism and pathogenas“
- The IMO have been discussed the issues involved and working towards a convention for more than 10 years

The Convention

The convention will enter into force 12 months after at least 30 States, the combined merchant fleets of which constitute at least 35 % of the gross tonnage of the worlds merchant shipping

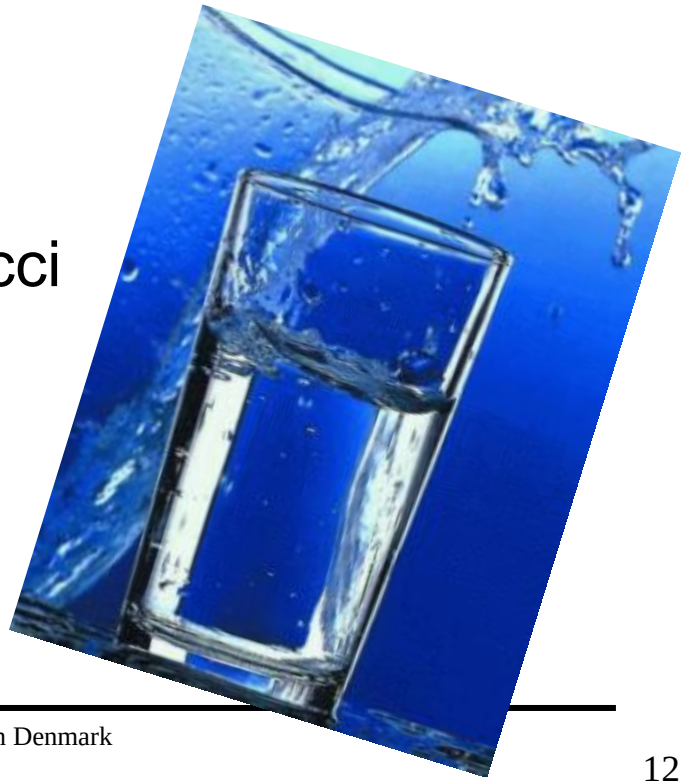
To date there are 18 signatories to the convention (15,36% of world merchant fleet!):

Albania, Antigua & Barbuda, Barbados, Egypt, France, Kenya, Kiribati, Liberia, Maldives, Mexiko, Nigeria, Norway, Saint Kitts and Nevis, Seychelles, South Africa, Spain, Syrian Arab Republic, Tuvalu

The IMO Convention

The ballast water discharge limits:
<10 viable organisms/m3 ≥ ≥ 50 µm
<10 viable organisms/ml ≥ 10 µm
<1 cfu/100 ml Vibrio Cholera
<250 cfu/1 00 ml Escherichia Coli
<100 cfu/1 00 ml Intestinal Enterococci

→ **nearly clean drinking water**



The IMO Convention

In 2004, IMO adopted an International Convention for the Control and Management of Ships' Ballast Water and Sediments.

The IMO convention will require ships constructed in 2009 or later to meet ballast water treatment standards.

By 2014, existing ships must also start to meet these standards.

The Convention

What does the convention require?

All ships will be required to:

- Carry out ballast water and sediment management on all voyages
- Have on board an approved ballast water management plan and a ballast water record book
- Ships of 400 gt and above subject to surveys and certification

Ballast water management options

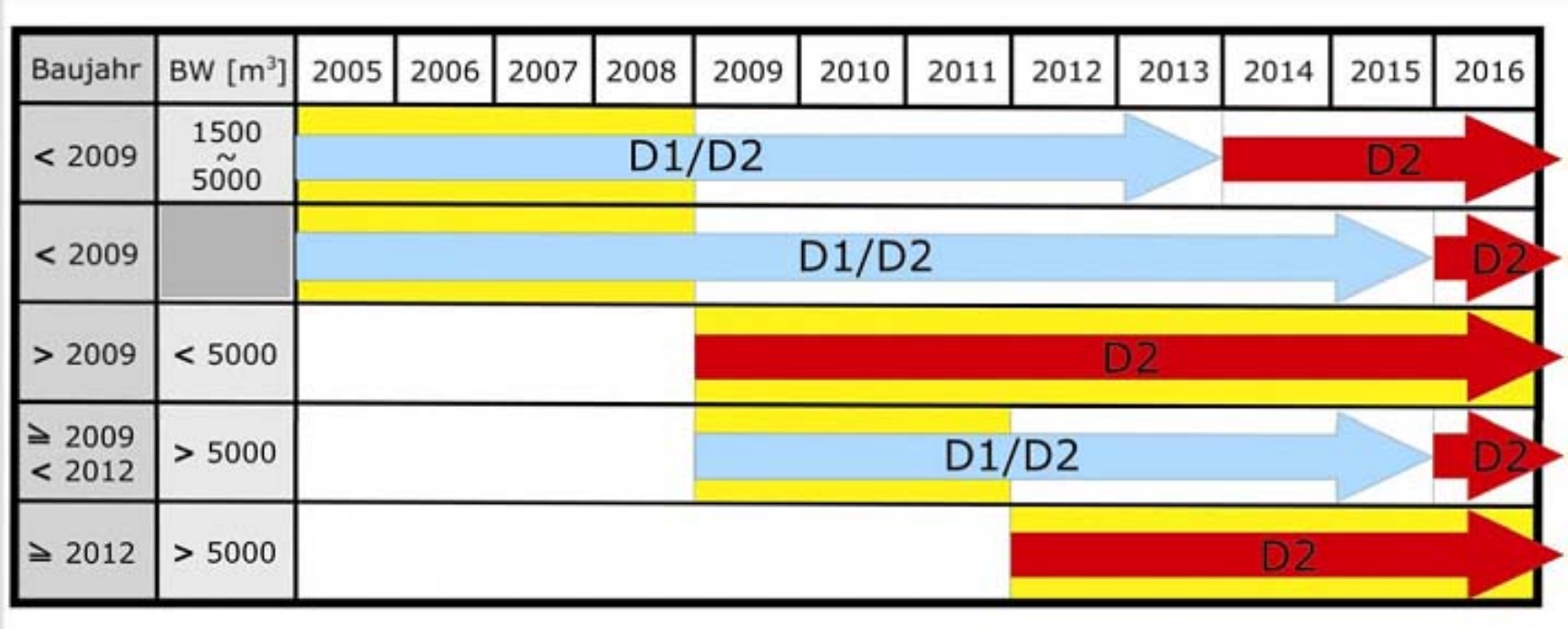
All ships will be required to:

- Carry out Ballast Water Exchange (BWE) to the standard required by the convention (D1-standard) or
- Use an approved ballast water treatment system that meets the standards of the Convention (D2-standard)

The Convention

Ballast water exchange standards D1

- BWE to be to an efficiency of at least 95 % volumetric exchange of Ballast Water or
- pumping through three times the volume of each Ballast Water tank is considered to meet the standard described above
- (Pumping through less than three times the volume may be accepted, provided the ship can demonstrate that at least 95% volumetric exchange is met.)


Baujahr
BW [m³]
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
< 2009
1500 ~ 5000
D1/D2
D2
< 2009
D1/D2
D2
> 2009
< 5000
D2
≥ 2009 < 2012
> 5000
D1/D2
D2
≥ 2012
> 5000
D2

The Convention

What to do and when?

NEW Agreement November 2007

Vessels constructed IN 2009 ONLY !

Ballast water capacity less 5,000m3; **Exchange or Treatment** until 2010;
Treatment after 2010. **Postponement of 1 Year**

What to do and when?

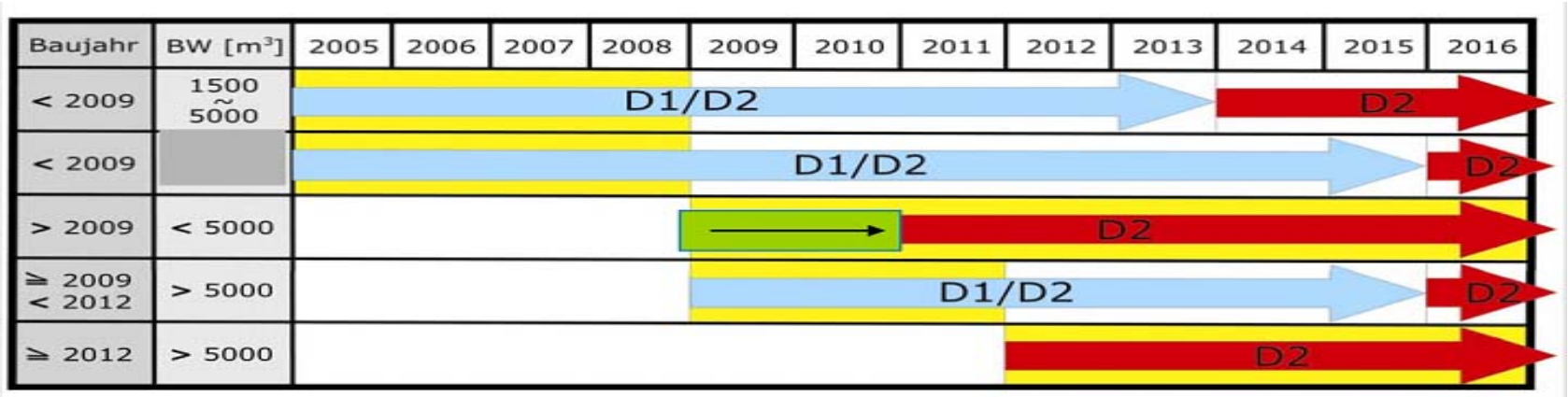
Vessels constructed before 2009 :

Ballast water capacity 1,500m3 to 5,000m3;

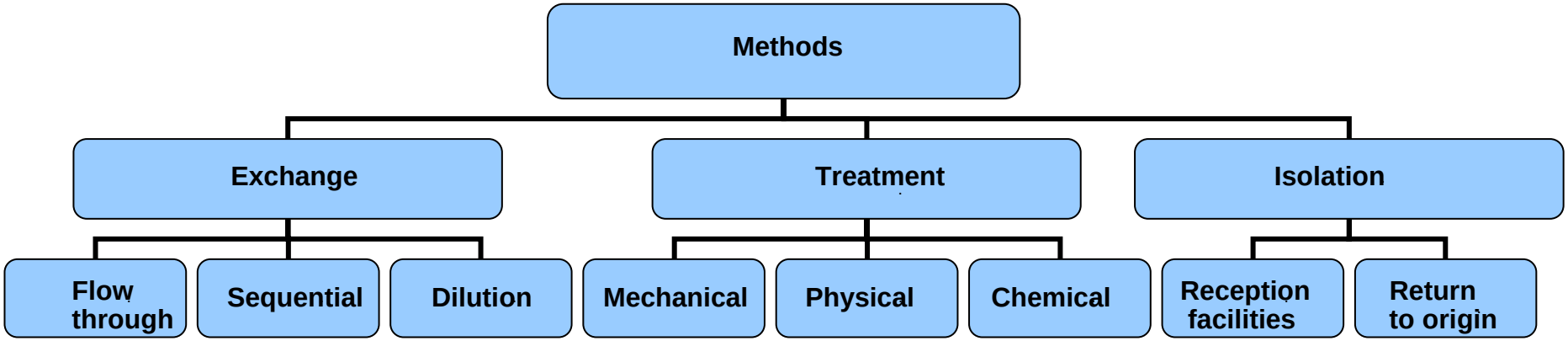
Exchange or Treatment until 2014; Treatment after 2014.

Ballast water capacity less than 1,500m3 or more than 5,000m3;
Exchange or Treatment until 2016; Treatment after 2016.

Vessels to comply by the first intermediate or renewal survey, which ever comes first, after the anniversary date of delivery.



Ballast water mamagement options



Ballast exchange sequential method

Description:

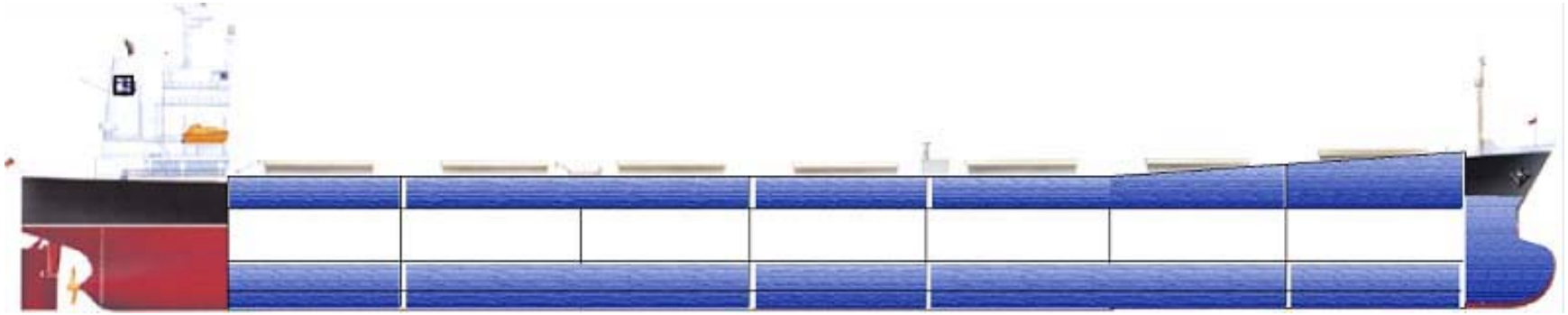
Emptying and refilling ballast tanks at open sea

Advantages:

Effective exchange of an al most complete volume

Disadvantages:

Careful planning



Ballast exchange flow through method

Description:

- Pumping open ocean water to full ballast tanks allowing overflow

Advantages:

- Easy to follow, no affect on stability and longitudinal strength

Disadvantages:

- Time and resource consuming
- Increased work load on pumps
- Additional piping may be required

Ballast exchange dilution method

Description:

- Pumping open ocean water to full ballast tanks through the TOP allowing discharge from the BOTTOM .

Advantages:

- Easy to follow, No affect on stability and longitudinal strength

Disadvantages:

- Time and resource consuming
- Increased work load on pumps
- Additional piping may be required

Treatment Technologies

A number of technologies have been tested or applied for ballast water treatment in order to meet the IMO Convention:

- Filtration
- Heat Treatment
- Ozone Treatment
- Gas Super-saturation
- Oxygen Deprivation
- Electrolysis- Chlorination
- Sonic Treatment
- Separation / Hydro Cyclone
- UV Radiation
- Chemical Treatment / Biocides
- Oxidation / Advanced Oxidation
- Pulsed Shock Wave / Cavitation

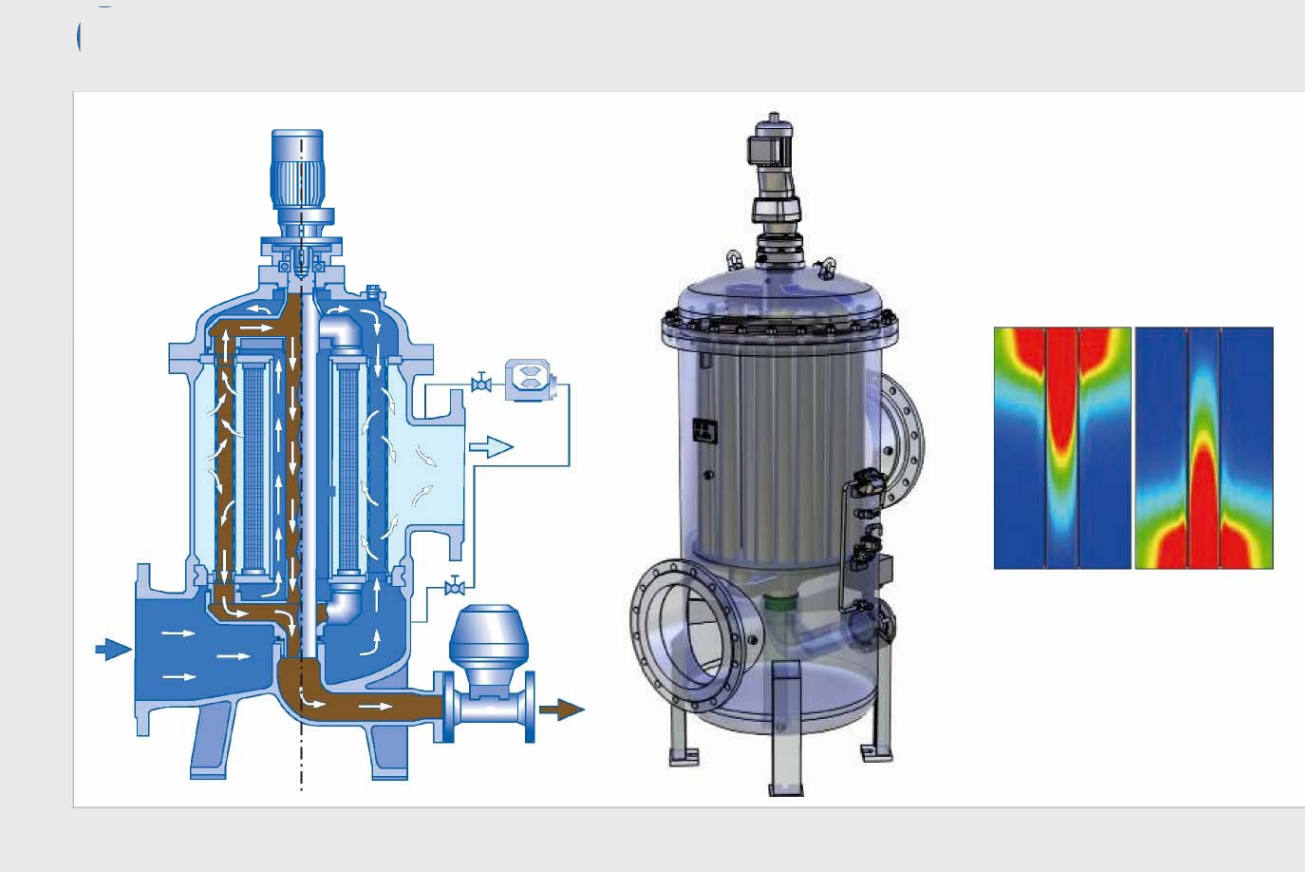
Ballast Water Treatment Systems

Alfa Laval	Sweden	Advanced Oxidation
Berkefeld RWO	Germany	Electrolysis + Arcal Filters
Dalian University	China	Advanced Oxidation
Degussa AG	Germany	Chemical Treatment
Ecochlor	USA	Chlorination (ClO2)
Hyde Marine	USA	UV + Biocide
MEP	USA	Electrolysis + Ionisation
NEI	USA	Oxygen Deprivation
Nutech O3	USA	Ozone
OceanSaver	Norway	O2 Deprivation + Cavitation

Ballast Water Treatment Systems

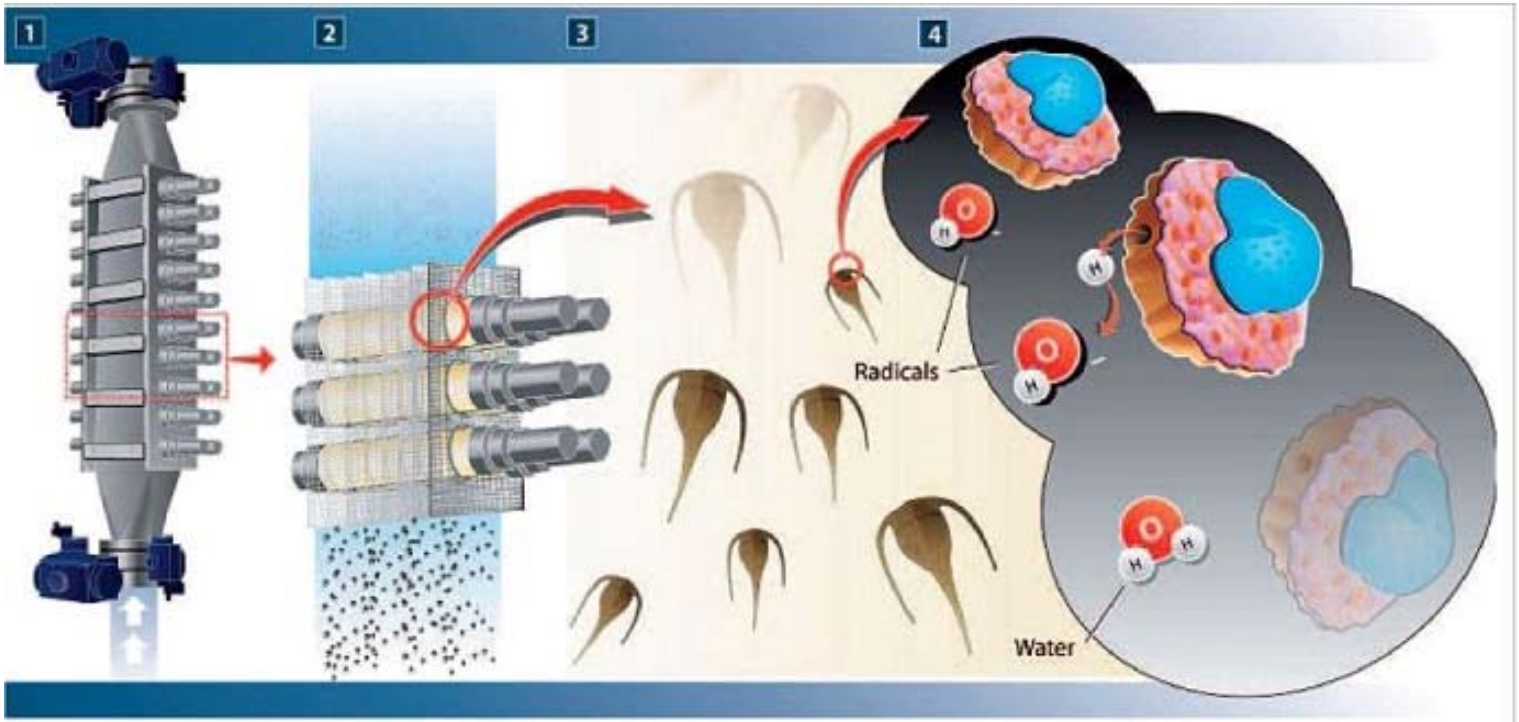
iESE	Singapore	Chemical Treatment
Qwater	USA	Sonic Treatment
NK Co., Ltd. South	Korea	UV + Electrolysis
Severn Trent De Nora	USA	Electrolysis
Greenship	Netherlands	Hydro Cyclone + Electrolysis
Alan H. Taylor	Australia	Heat Treatment
Gauss	Germany	UV
L. Meyer	Germany	Chemical Treatment
Velox	Canada	Hydro Cyclone + UV
AquaHabiStat	USA	Oxygen Deprivation
Hamann AG	Germany	Hydro Cyclone + Chemical

Ballast Water Treatment Systems – Bollfilter, Germany



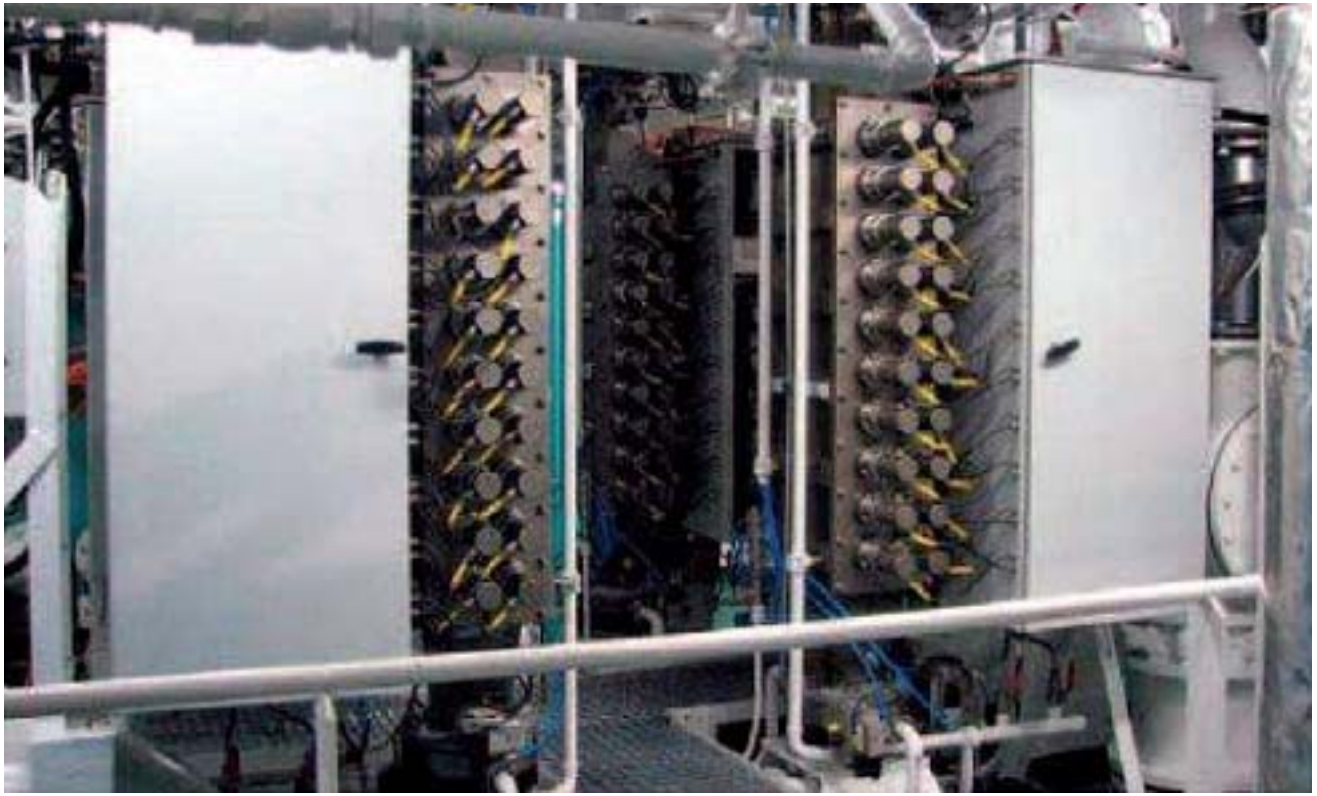
The filter design is available in 9 sizes covering a flow range from 125 to 3000 m3/h in one single compact filter unit.

Ballast Water Treatment Systems – Alfa Laval, Schweden

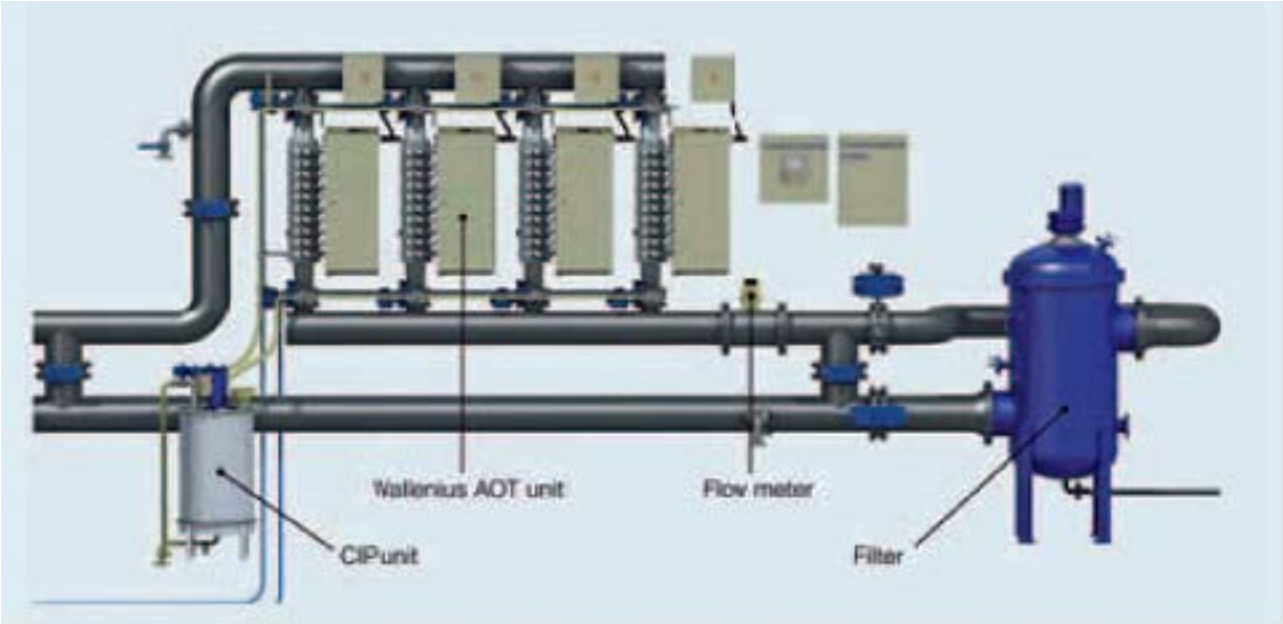


Organisms passing through a Wallenius AOT unit are exposed to hydroxyl radicals, which break down the cell membrane and render the organisms non-viable

Ballast Water Treatment Systems – Alfa Laval, Schweden

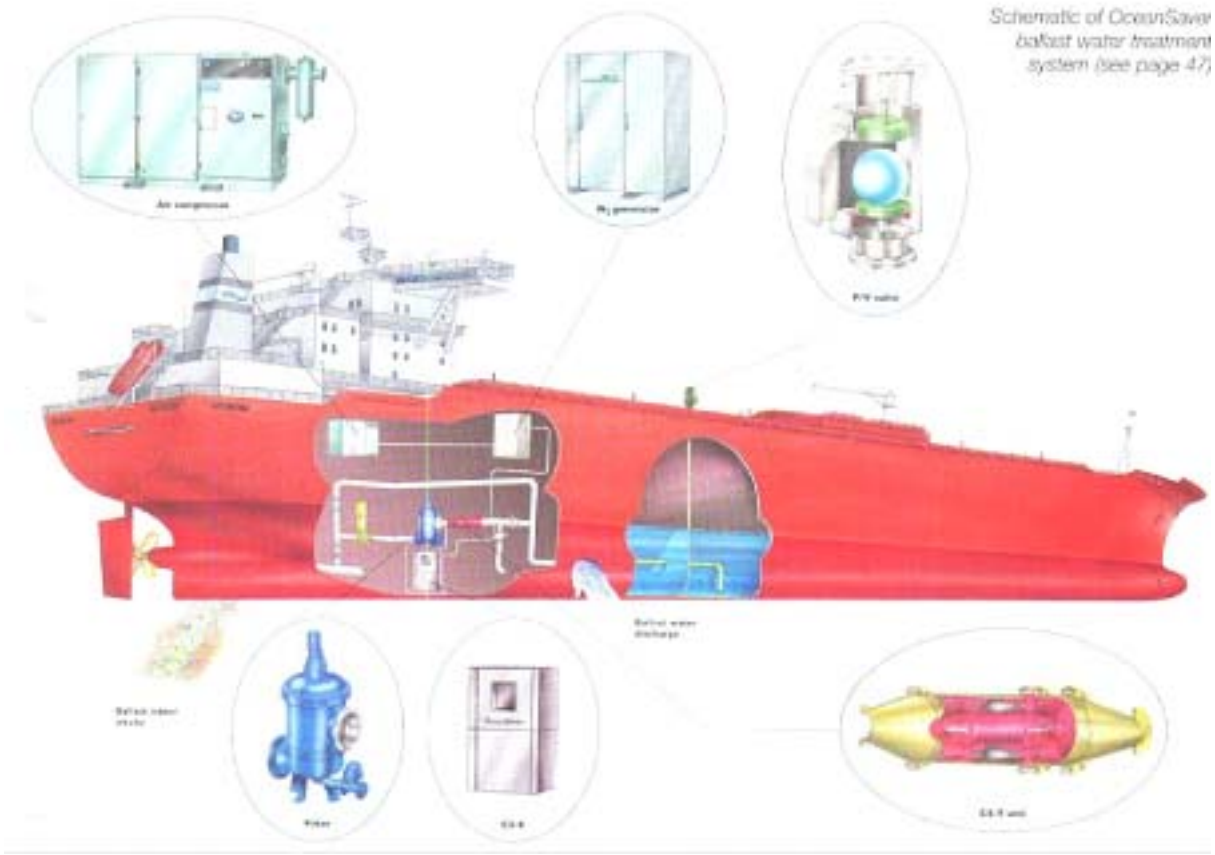


Ballast Water Treatment Systems – Alfa Laval, Schweden

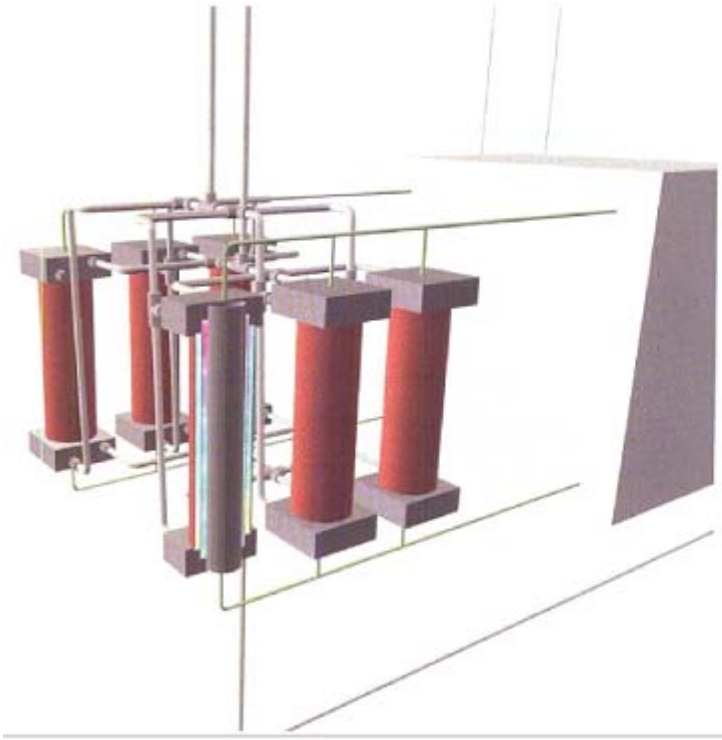


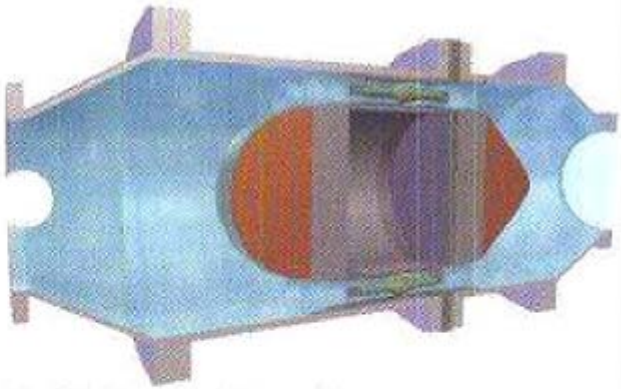
The layout of a typical PureBallast system, with components fit into the existing pipework

Ballast Water Treatment Systems – Ocean Saver, Norway



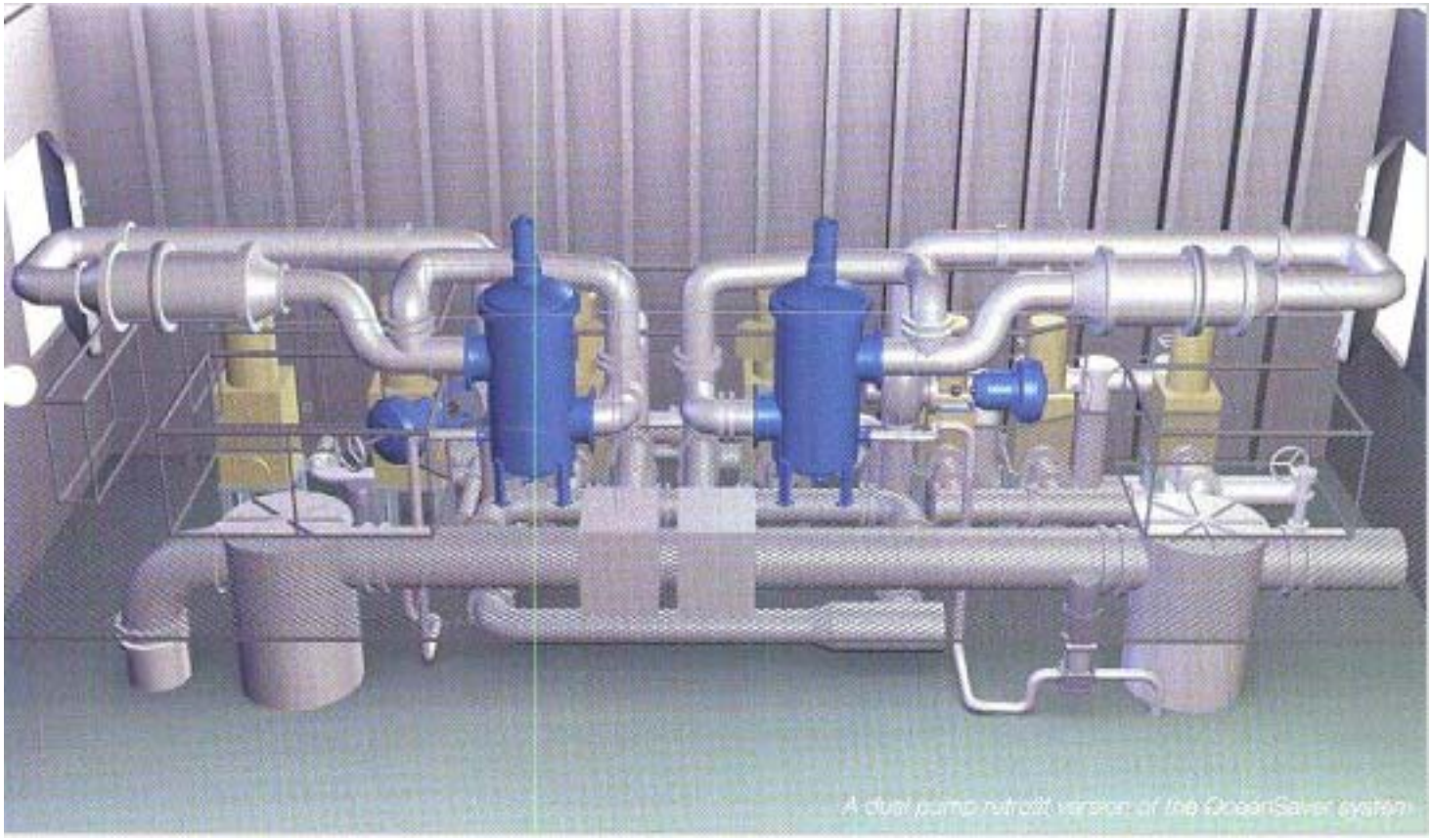
Ballast Water Treatment Systems – Ocean Saver, Norway



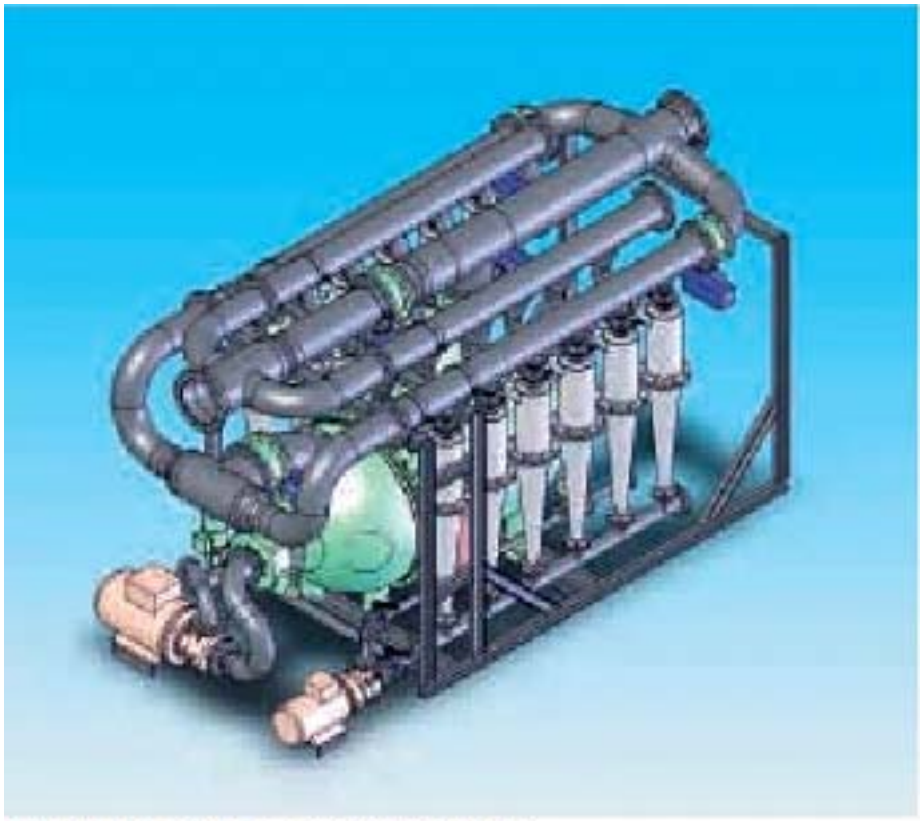


The C3-T unit of OceanSaver creates implosion pressures up to 1,000 bar and implosion frequencies of more than 100 kHz

Ballast Water Treatment Systems – Ocean Saver, Norway



Ballast Water Treatment Systems – Hamann AG, Germany



Extremely compact: S500 (500 m³/h)

Ballast Water Treatment Systems – Hamann AG, Germany

Fine Filter and Cyclones

2 x 250 m³/h containerized

Ballast Water Treatment Systems

Hamann AG, Germany

RWO, Germany

Arcal disc filtration

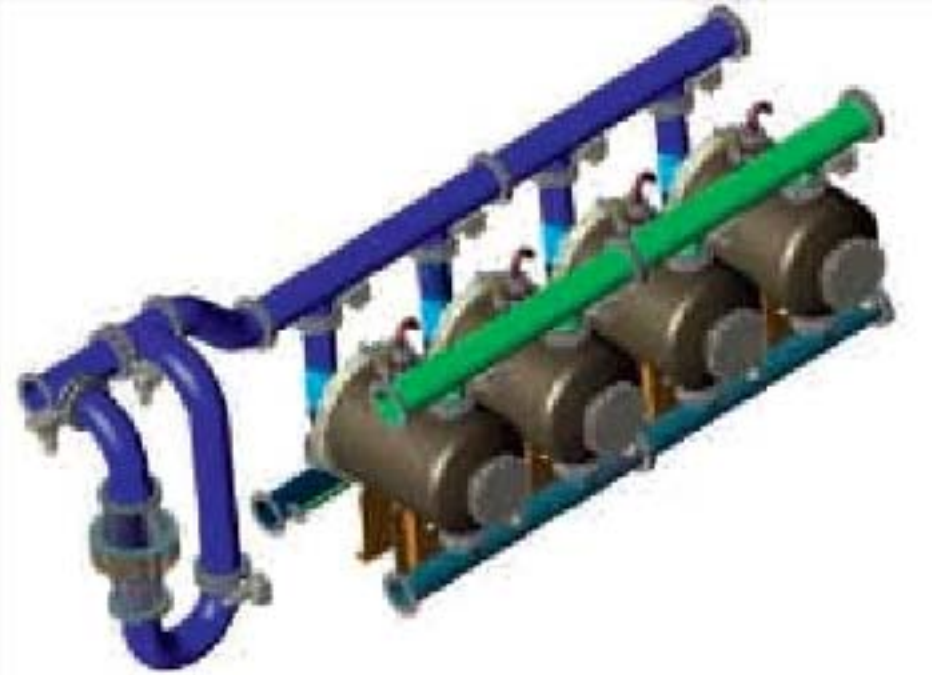
50 micron plus electrolysis

+ Ectosys

Continues algae monitoring

RWO's new ballast water disc filter

Ballast Water Treatment Systems – ROW, Germany



RWO's full-scale CleanBallast! system with a capacity of 500 m³/h

Conclusion

Ballast Water Management Treatment plants will become obligatory for research vessels, although nearly no ballast water exchange takes place.

For newbuildings space for those power plants have to be considered in anticipation of IMO Resolution comes effective.

Questions?

PRI-D

THERMAL STABILITY
FUEL OIL TREATMENT

- ✓40-50% reduction visible smoke/PM
- ✓Less carbon is formed
- ✓8% reduction NOx emissions
- ✓2-4% fuel efficiency improvements
- ✓30-40% reduction UHC
- ✓Improved spray patterns
- ✓Soot reductions
- ✓6% reduction CO emissions
- ✓Inhibits Algae growth
- ✓Huge reductions fuel filter changes