

BWM Convention, the way forward Discussion on the available technologies

BWM Summit

Athens Metropolitan Expo, Posidonia 2016

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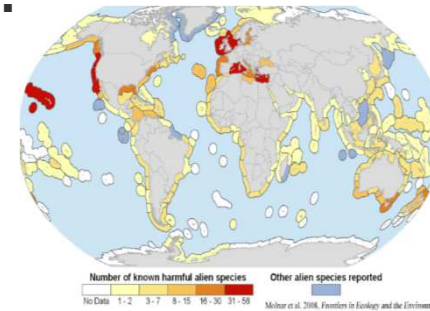
09 June 2016

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Invasive species : Economic impact

Global economic losses for governments:

Estimation : € 7 billion / year



Individual economic losses for Owners:

€ 100,000 to € 1,000,000 / ship
(investment + installation)

plus

Operational cost

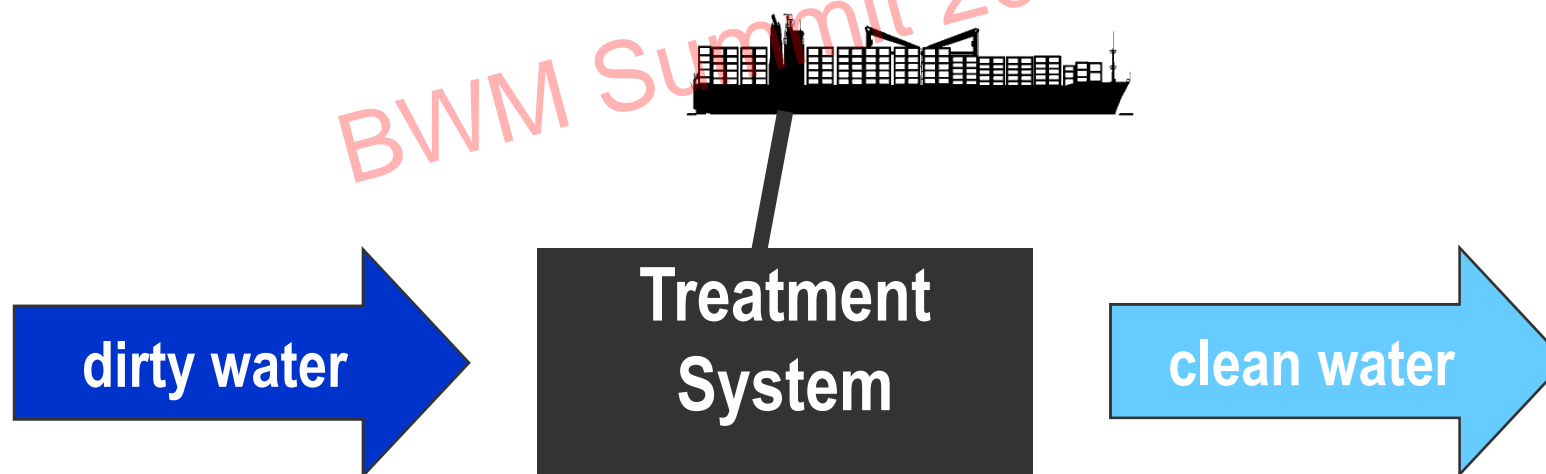
(0.01 to 0.20 Euros per cub.m BW) / ship



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Owner's wish list

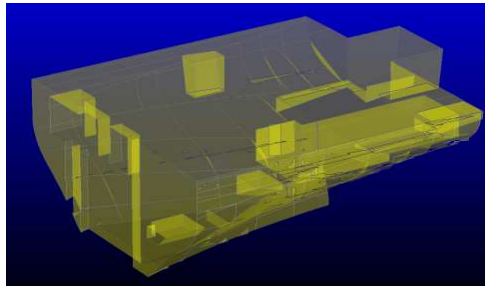
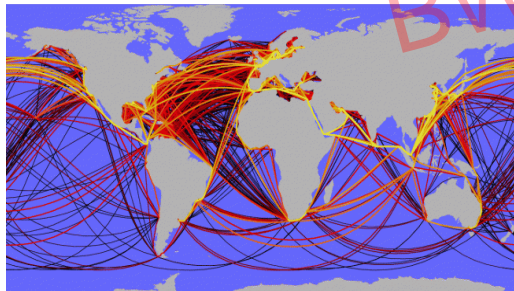
- Small
- Simple
- Effective
- Easy to install
- Easy to operate and maintain
- Cheap
-



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Parameters to be considered

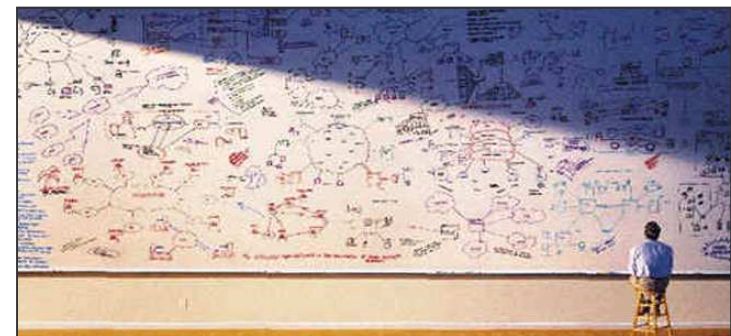
- Ship type, size & age (operational issues and ballast capacity)
- Ship routing (country, ports, rivers, temperature, salinity, sediments disposal etc)
- Tank coating (certification & testing reports by makers / suppliers)
- Installation of the BWT system on board (arrangement, footprint, weight, connections etc)
- Pressure loss (varies 0.3 to 3.5 bars)
- Energy consumption (load balance, when the power is needed)
- Time & Occurrence (how often the BW is discharged)
- Maintenance (consumables & spare parts availability and after sales service)
- Cost (purchase, installation, operational, maintenance, training)



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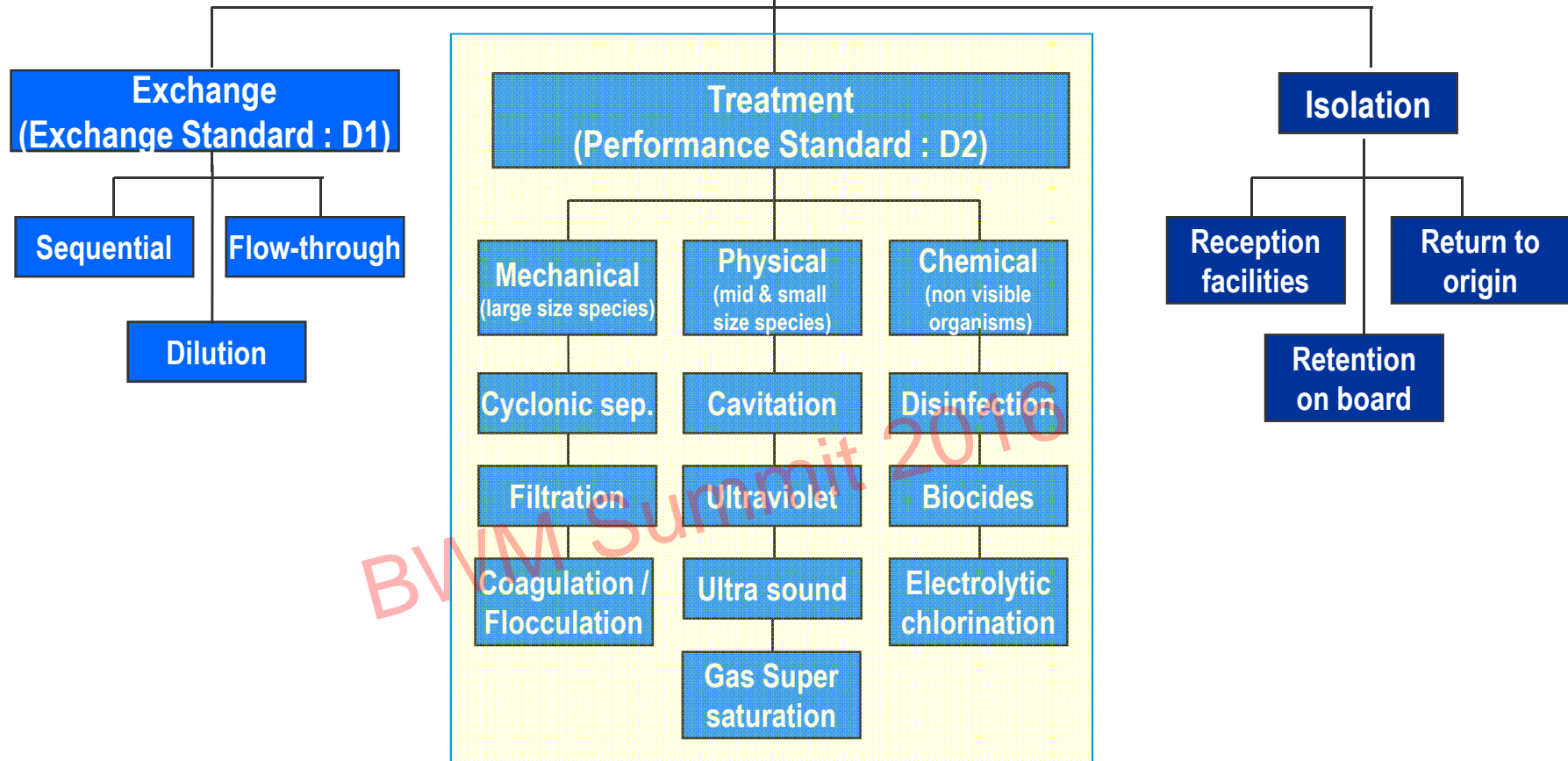
Complexity issues

- complex market many manufacturers
market not transparent yet
- complex technology multitude of systems based on different technology
requires different training
- complex sea systems typically developed for land-based application
problems on board likely to occur



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Ballast Water Management Methods



Treatment system

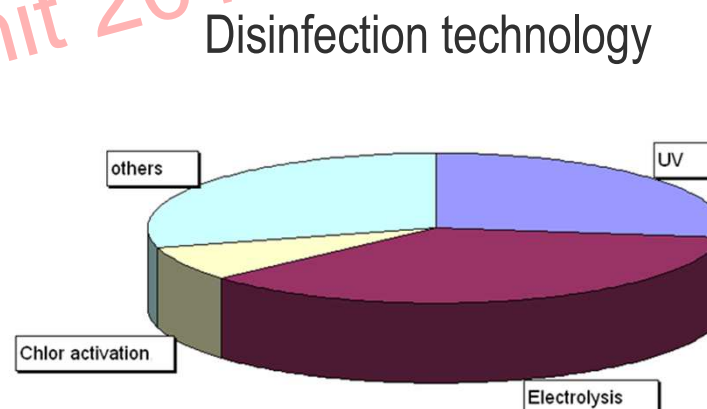
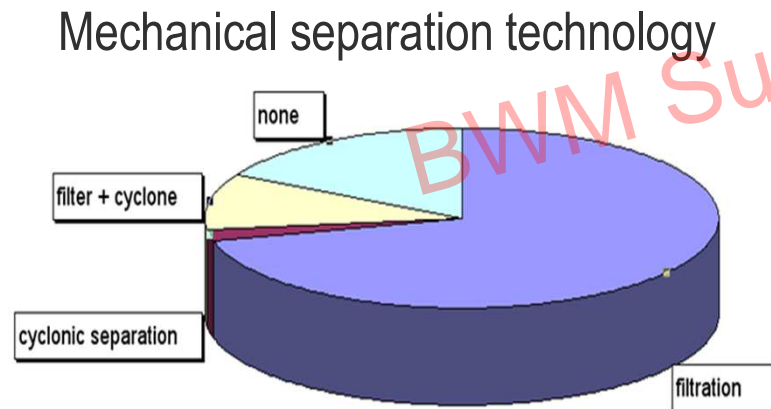


Combination of Treatment methods

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Ballast water treatment - Technology

- ◆ around 50 manufacturers
- ◆ wide variety of treatment technology (G8+G9)
- ◆ majority use mechanical separation as first step
- ◆ for disinfection step - trend to UV and electrolysis



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Filtration

Principle:

- Sediment and particles removal by disc and screen filters
- Self-cleaning procedures
- Filtration grades down to 100 / 50 / 20 mm

Technical issues:

- Not effective for pathogens
- Filter units create back pressure
(increases for smaller filtration grades)
- Self-cleaning procedures reduce nominal flow rate
(e.g. due to high sediment load)



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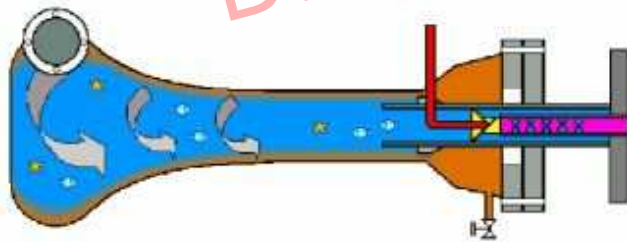
Cyclonic separation (Hydro cyclone)

Principle:

- Acceleration of water by rotational flow direction inside facility
- Separation of solid particles due to centrifugal forces

Technical issues:

- Only particles with specific weight different from water can be separated
- Pressure drop
- Noise
- Maintenance



No Turbidity



80 NTU

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Coagulation, Flocculation

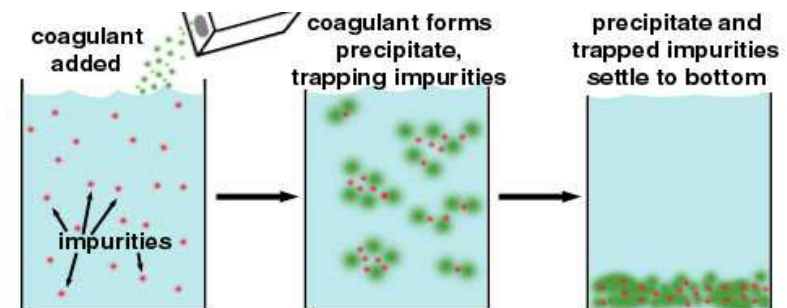
Principle:

- Addition of coagulants to BW that create “starting cells” for flocculation of solid particles to bigger bodies
- Removal of bigger cells e.g. by filters
- Additionally, magnetic/electrical forces can be applied to improve separation of flocs

Technical issues:

- Storage tank for additives needed
- Sludge tank for flocked-out particles needed
- Time consuming process

(voyage length to be considered !)



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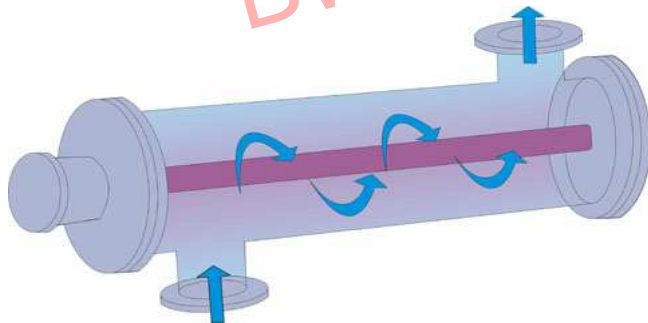
Ultra-Violet (UV) radiation

Principle:

- Amalgam lamps produce UV radiation
- UV light attacks/breaks cell membranes

Technical issues:

- Efficacy depends on turbidity of BW (sediments limit transmission of UV radiation)
- UV lamps need maintenance for “clear light”
- High power consumption



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Chemical additives

Principle:

- Direct adding of disinfecting chemicals to BW to disinfects:
Ozone (O_3), Hydrogen peroxide (H_2O_2), Peracetic acid (Peraclean ®),
Chlorine / Chlorine dioxide, Seakleen® ("Vitamin K")

Technical issues:

- Dosing accuracy
- "Holding time" in tank required
- Corrosion
- Space for storage
- Safety



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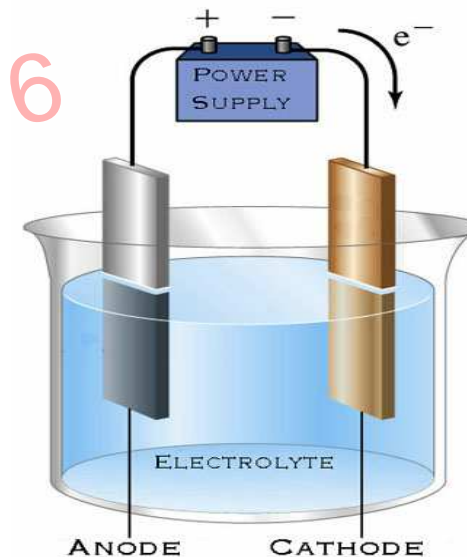
Electrolysis / Electro-chlorination

Principle:

- Electric current applied to BW within electrolytic chamber
- Sodium chlorite in sea water, split to active Chlorine, which disinfects water

Technical issues:

- Only applicable to sea water with certain level of dissolved "salt"
- Corrosion
- Safety
- High power consumption
- Creates unwanted by-products depending on applied current and used electrodes



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De-oxygenation / Gas super-saturation

Principle:

- Removal of dissolved oxygen in BW and replacement by inactive gases (e.g. nitrogen)

Technical issues:

- Time consuming process (voyage length to be considered)
- Controlled atmosphere in tanks needed, to avoid re-oxygenation (pressure valves instead of common air pipe heads for BW tanks)



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Approved BWM systems

Various BWM systems have received final approval.



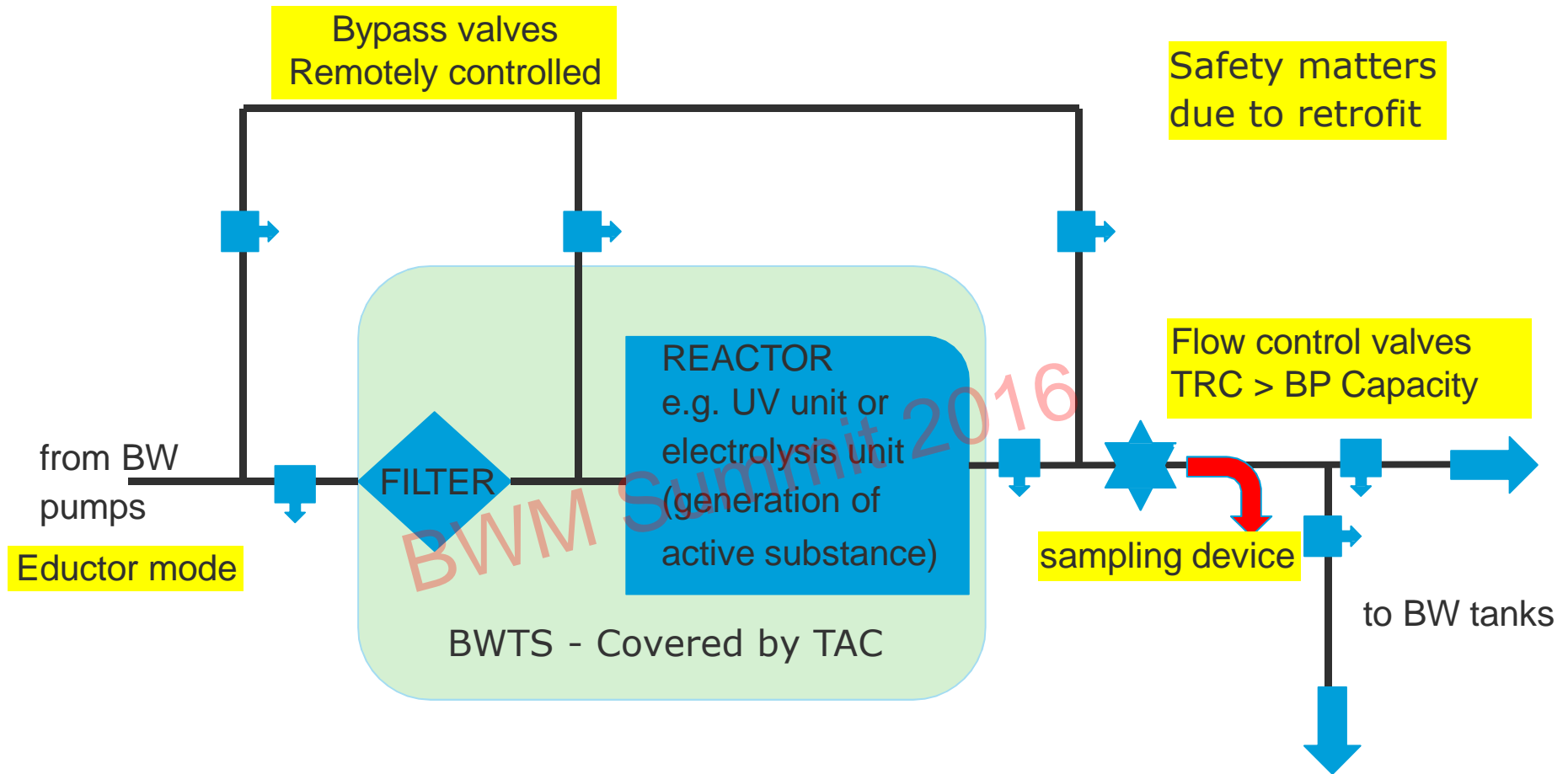
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Full list can be found at:

<http://www.imo.org/OurWork/Environment/BallastWaterManagement/Documents/table%20updated%20in%20May%202013%20including%20TA%20information.pdf>

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Simplified arrt. of BWMS – Some technical aspects



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Thanks for your attention!



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