

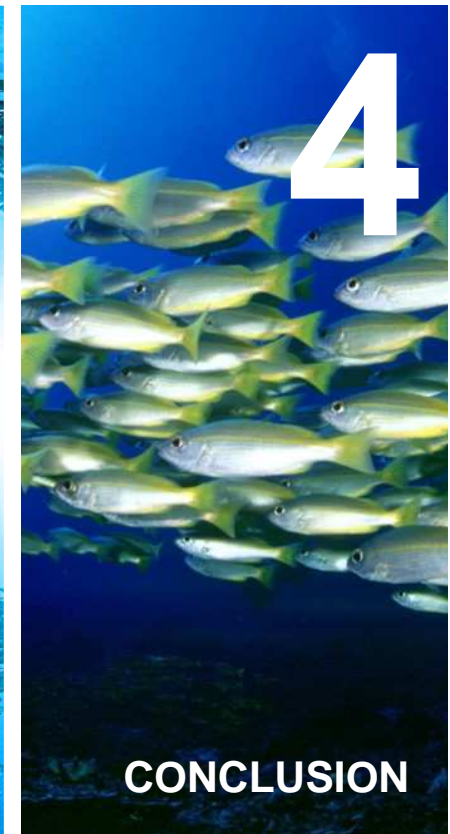


# GOLTENS GREEN TECHNOLOGIES

Ballast water treatment retrofits process, experiences  
and challenges

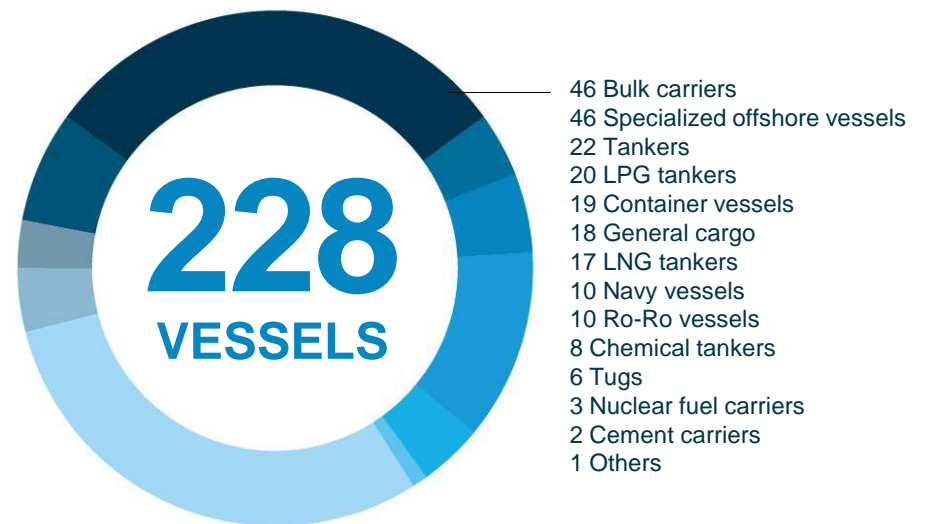
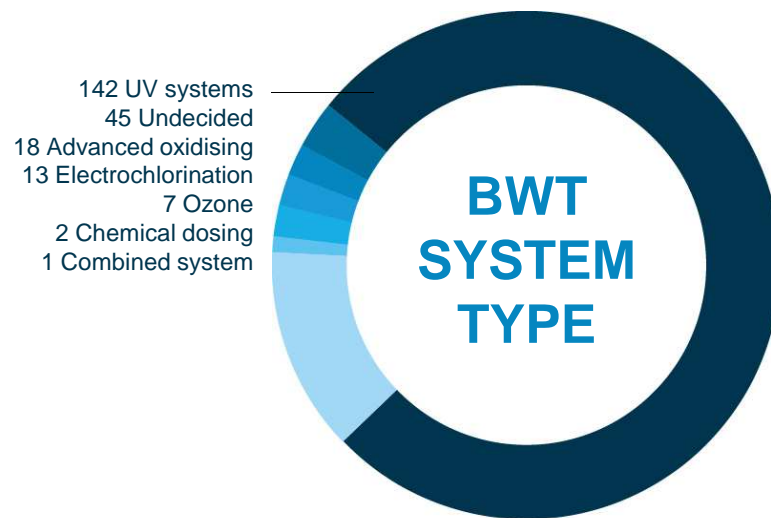


## Content





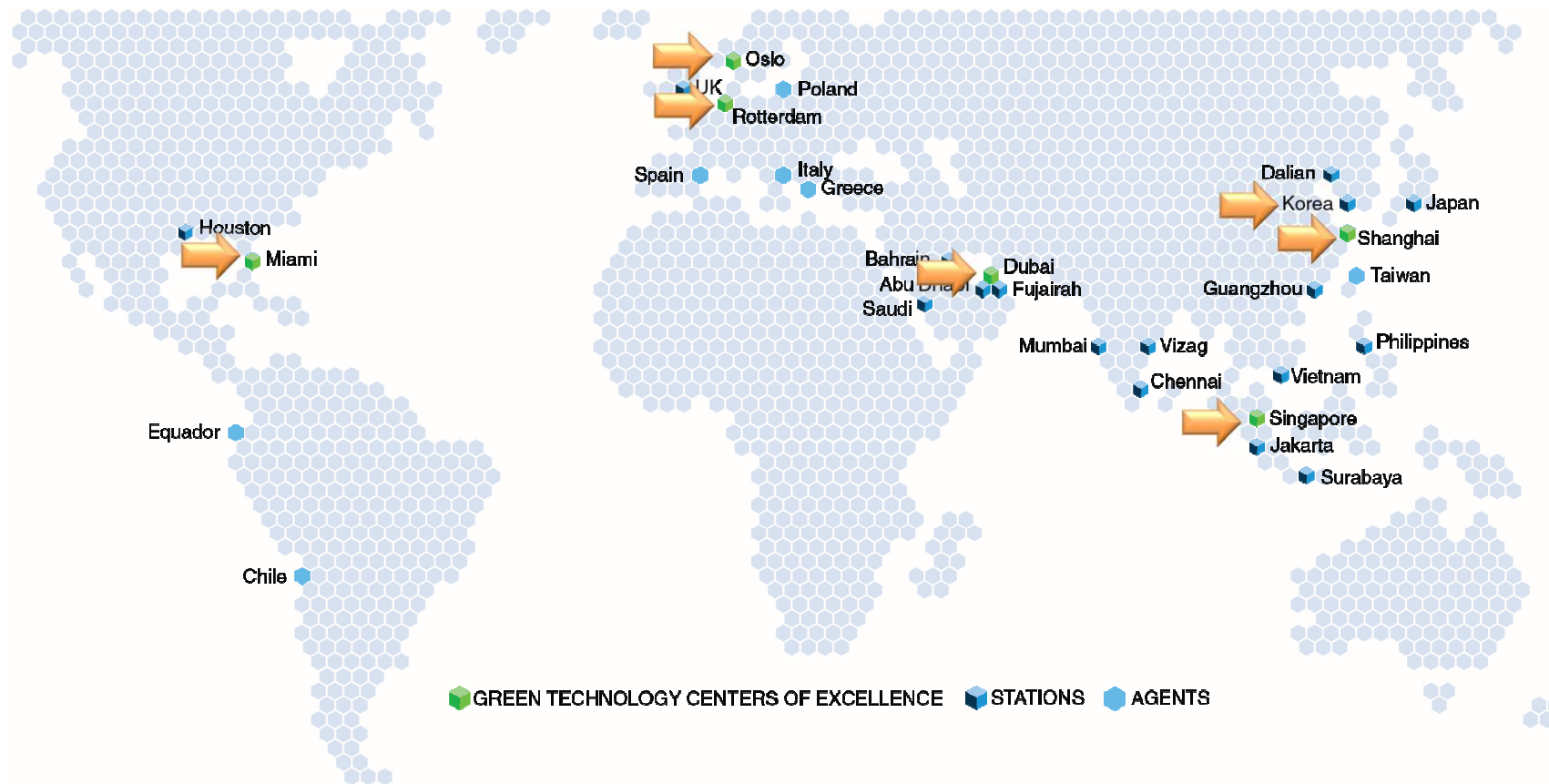
# Goltens Green Technologies



DATA AS OF JAN 2017

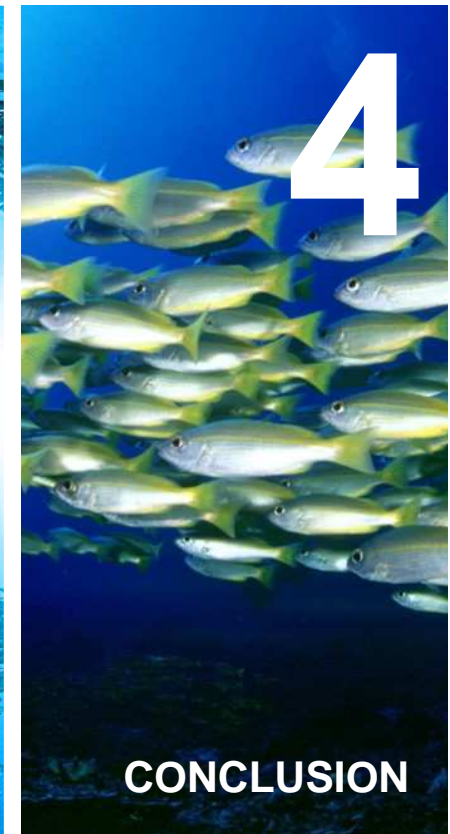


# Goltens Network



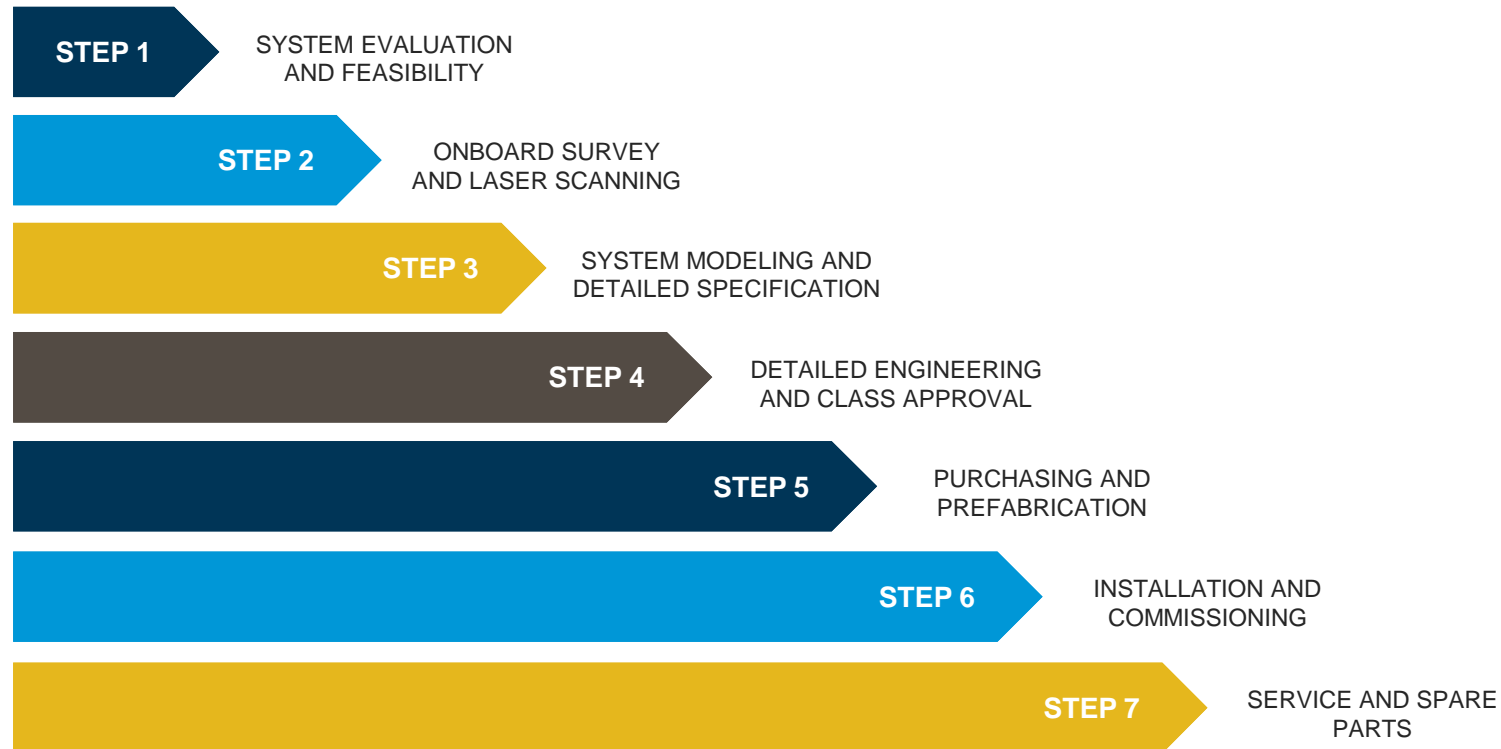


## Content





# BWTS Retrofit Process





## Step 1: System Evaluation & Feasibility

### GENERAL CONSIDERATIONS

- IMO/USCG Type Approval
- Sailing area
- Capacity needed
- Power requirement
- Equipment footprint
- CAPEX/OPEX

### BWT TECHNOLOGIES

#### **Separation**

- Filtration
- Hydrocyclone
- Coagulation/flocculation

#### **Disinfection technology**

- Chlorination
- UV
- Ozone
- Cavitation/Ultrasound
- Deoxygenation
- Advanced oxidizing

### VESSEL CONSIDERATION

- Type of vessel
- Available space
- Use of existing ballast system
- Available power



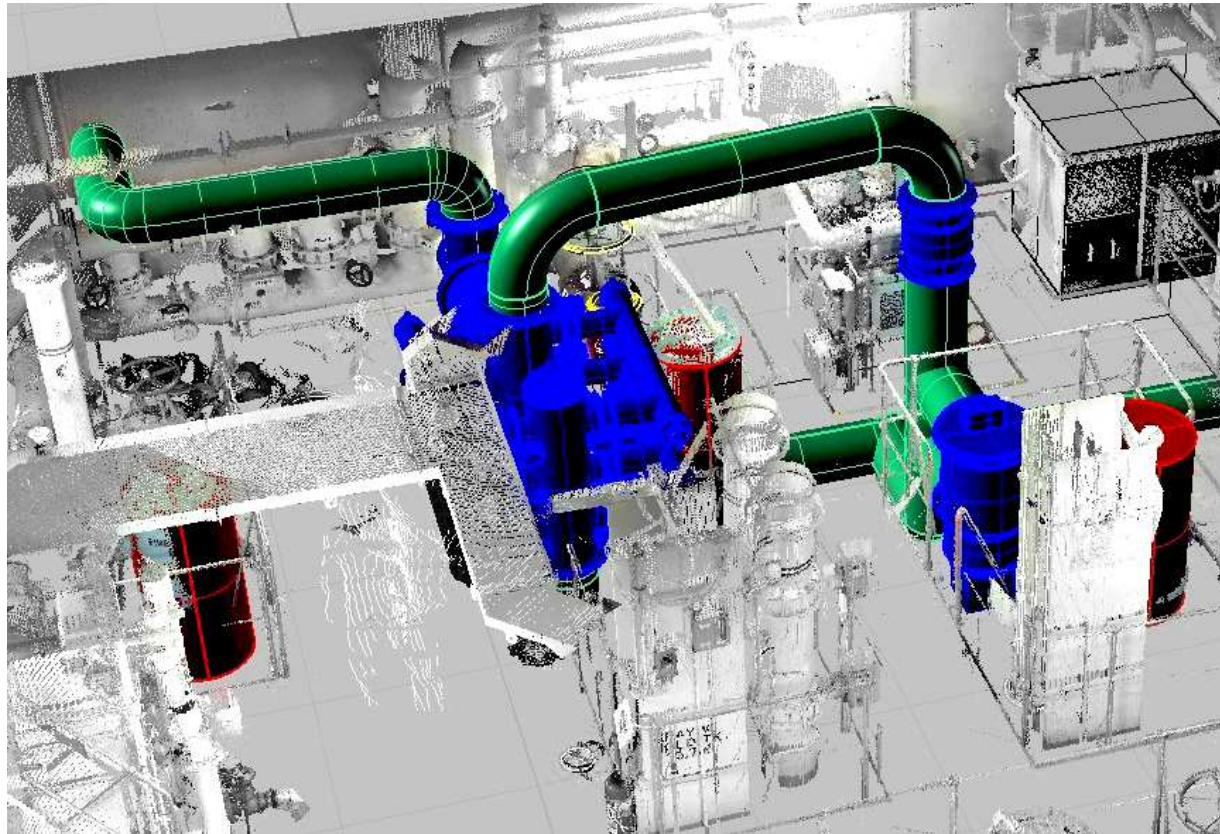
## Step 2: On Board Survey and Laser scanning

- Good preparation is key
- Laser scanning to capture as built situation
- Survey checklist to gather necessary information
- Minimal disturbance of ship's operation
- Visit takes approximately 6-10 hours
- A visit report summarizing the survey will be provided to the client





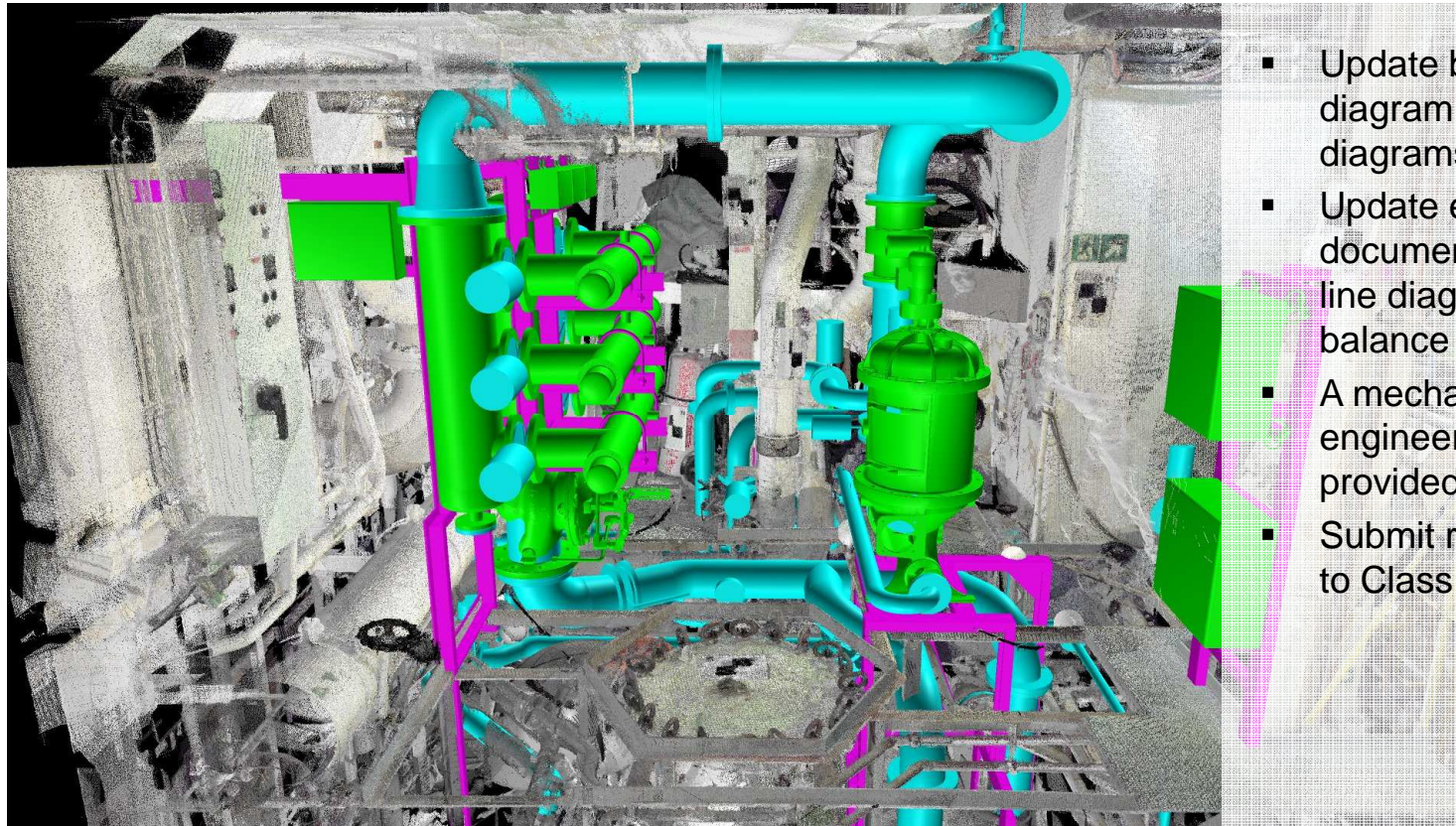
## Step 3: System Modeling and Detailed Specification



- 3D model of BWTS overlaid onto as built situation
- Comparison of shortlisted BWTS if required
- A concept engineering report will be provided to the client



## Step 4: Detailed Engineering

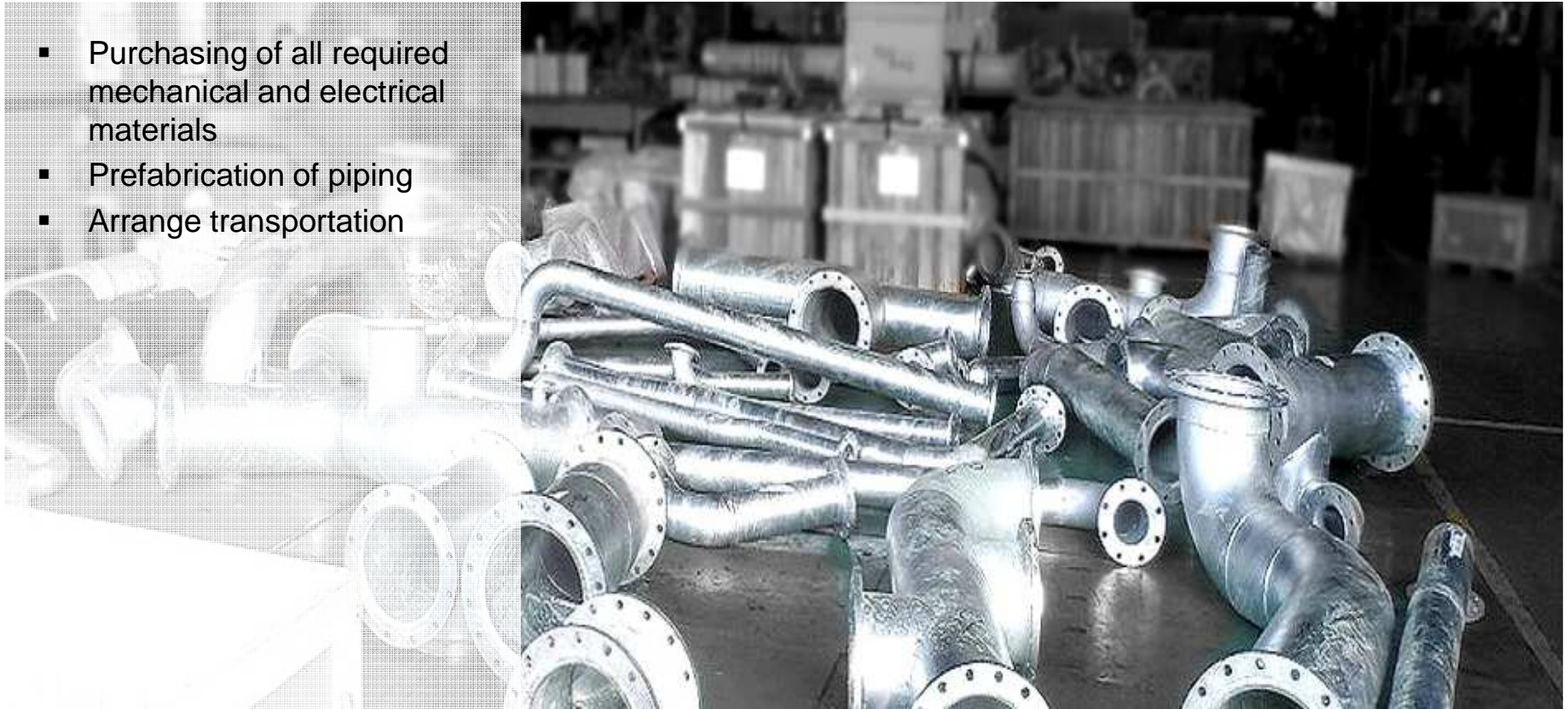


- Update ballast water diagram and other related diagrams if necessary
- Update electrical documentation like single line diagram and load balance
- A mechanical and electrical engineering package will be provided to the client
- Submit required documents to Class



## Step 5: Purchasing and Prefabrication

- Purchasing of all required mechanical and electrical materials
- Prefabrication of piping
- Arrange transportation





## Step 6: Installation On Board

### DURING DRYDOCK

- Time restriction
- Possible delays due to multiple ongoing jobs

### DURING DRY DOCK & VOYAGE

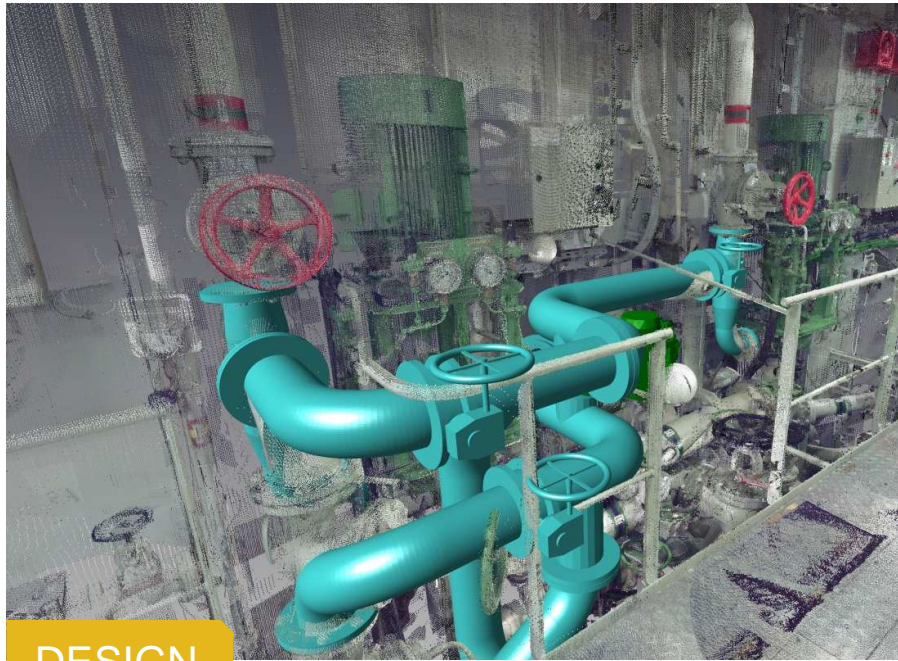
- No time restriction during dry dock
- Time consuming jobs can be finalized during voyage

### DURING VOYAGE

- Requires a very good preparation
- No time constraint
- Installation team on board during voyage



## Step 6: Installation On Board



DESIGN



INSTALLATION



## Step 6: Commissioning and Class survey



- Commissioning normally takes 2 or 4 days
- When finalized a Class survey will be required



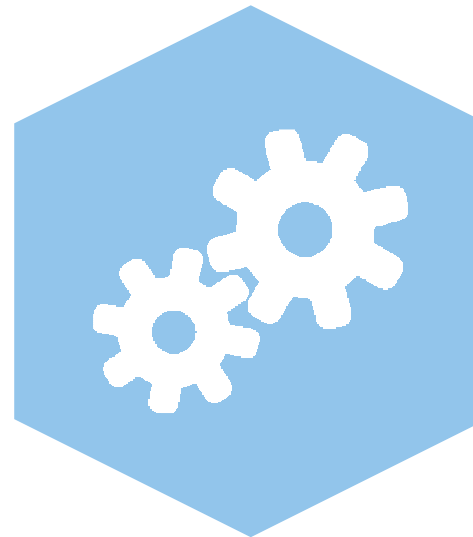
## Step 7: Service & Spare Parts

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MAINTENANCE  
AND REPAIR

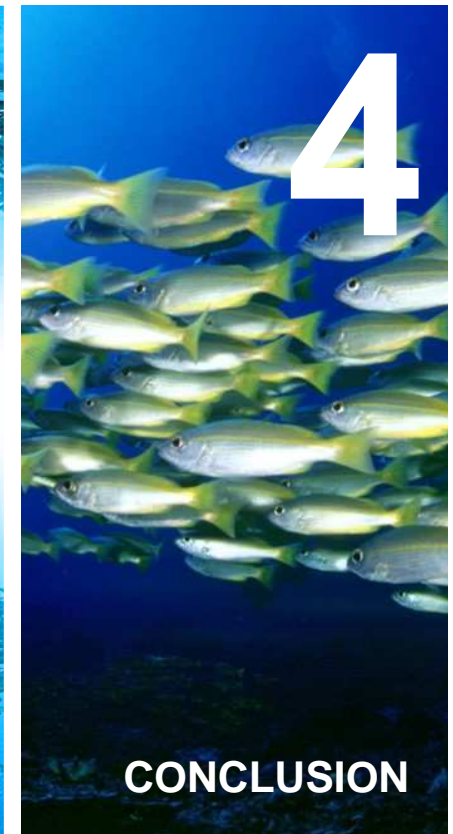


SPARE PARTS





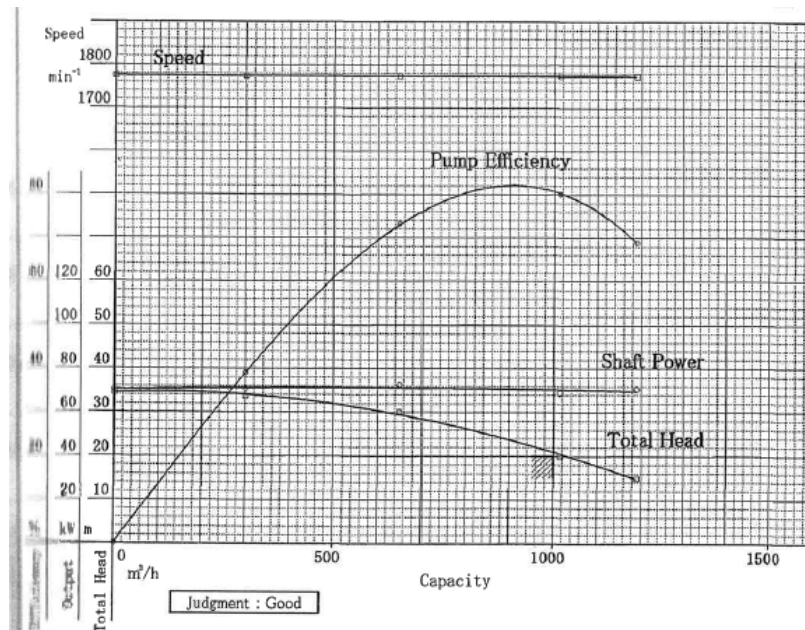
## Content





# Mechanical Engineering challenges

Pump performance existing ballast pump(s)



Integration into existing ballast system



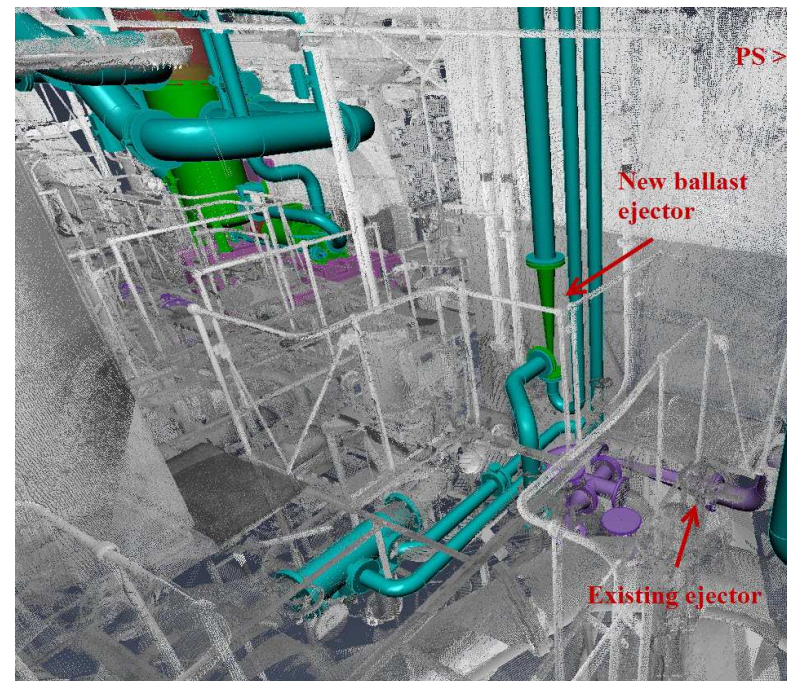


# Mechanical Engineering challenges

Overboard connection backflush pump



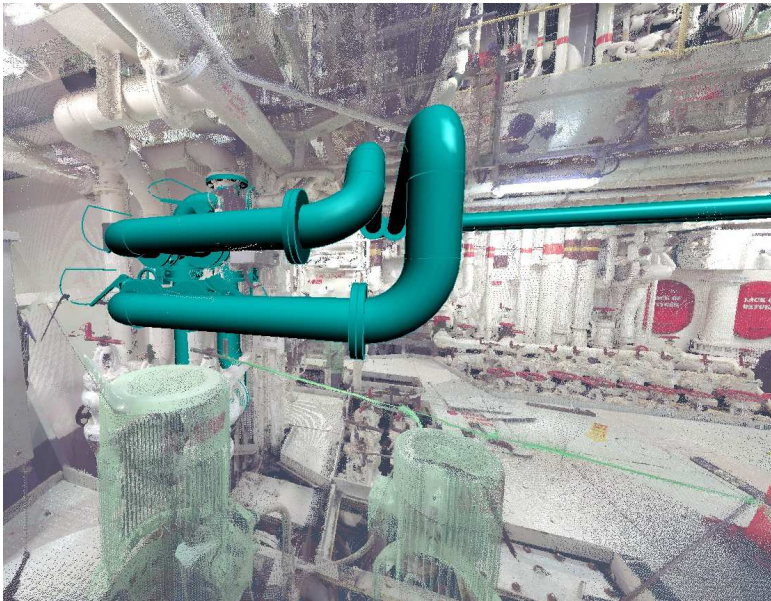
Stripping ejector





# Mechanical Engineering challenges

Aft peak tank connection



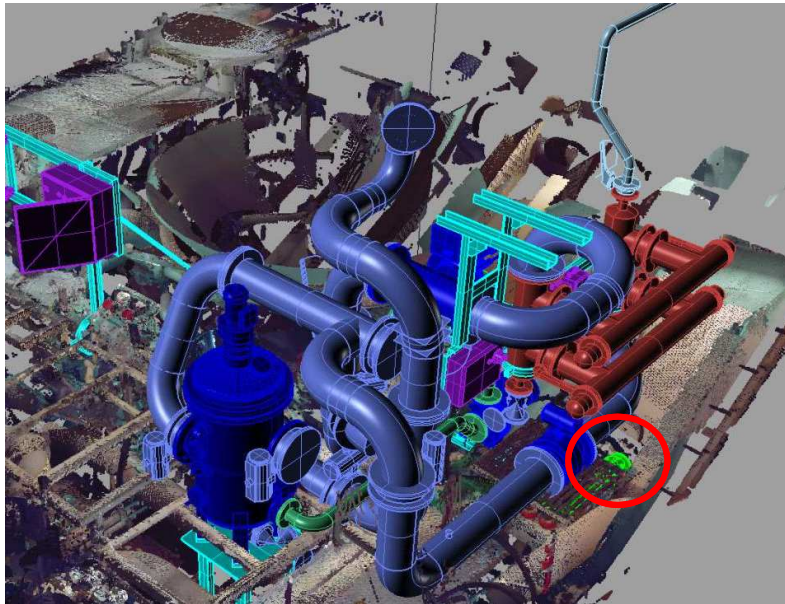
Collisions with existing equipment etc.



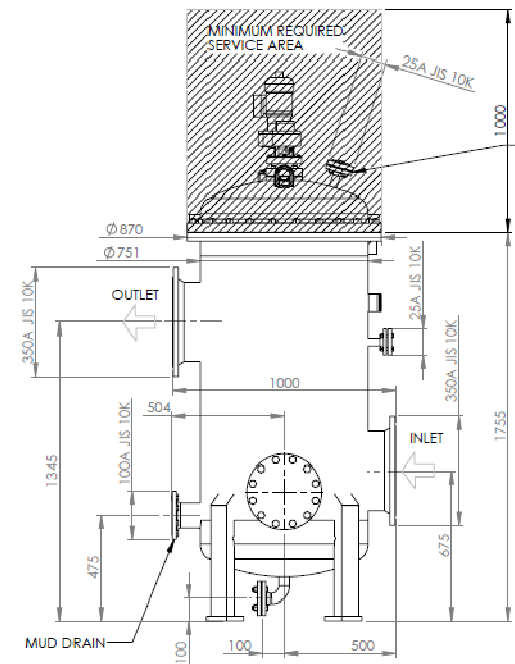


# Mechanical Engineering challenges

Maintenance space existing equipment



Maintenance space BWTS equipment





## Sister Vessels



SCAN  
EACH  
VESSEL



MODEL  
ONCE



COLLISION  
CHECK ON  
SISTER SHIPS



MODIFY  
WHERE  
NECESSARY



## Sister vessels

Sister appears to be a cousin





# Electrical Engineering challenges

- Power consumption BWTS vs available power
- Availability of spare breakers
- Location electrical cabinets
- Routing of cables
- Use of existing cable trays
- Integration into ship's automation system





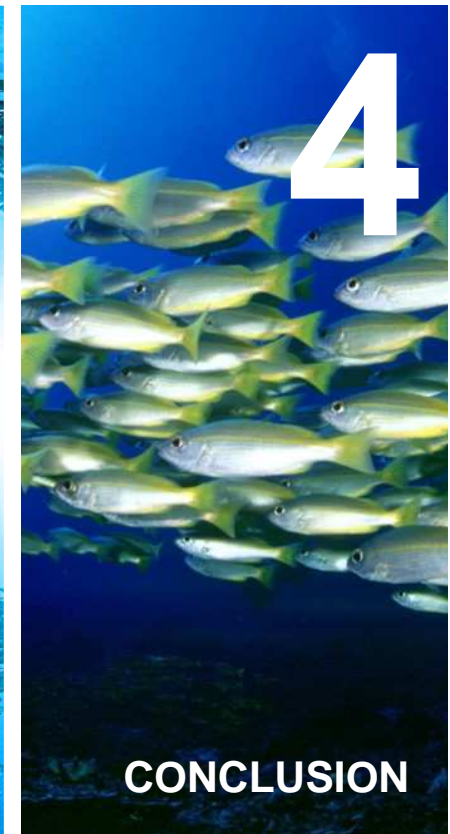
## Installations experience



- Coordination with yard and vessel is key
- Transportation from materials to BWTS location o/b
- Preparation of the BWTS location
- Progress update to client
- Coordination of automation integration/commissioning and Class survey



## Content





## Conclusion



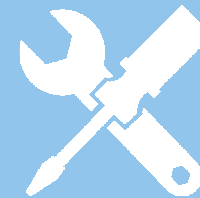
A SUCCESSFUL  
BWTS RETROFIT  
STARTS WITH A  
PLAN



DETAILED  
DESIGN AND  
PREFAB PIPING  
CAN REDUCE  
INSTALLATION  
TIME



REDUCED  
DESIGN COST  
ON SISTER  
VESSELS



COORDINATION  
BETWEEN  
INVOLVED  
PARTIES DURING  
INSTALLATION IS  
KEY