



Workshop Water Ballast Management Tutto pronto per l'entrata in vigore?

Facoltà di Ingegneria di Genova
17 Maggio 2012



About OceanSaver AS

- Norwegian based company
- Founded 2003
- Headquarter in Drammen, 40 km from Oslo, Norway
- Mission:
 - *To Develop, Manufacture and Deliver World Leading IMO Compliant Systems for Ballast Water Management*
- Vision:
 - *Creating today her tomorrow*
- Ballast water treatment is our sole focus
- Employees background from marine / offshore industry
- Leading supplier for larger vessels with unique know-how and competence

Target market segments

Crude Oil Tankers

- VLCC
- Suezmax
- Aframax



Chemical Tankers

- Ballast pumps from 2 x 750m³/h



LNG Carriers

- Ballast pumps from 2 x 2.000m³/h



Bulk Carriers

- Ballast pumps from 2 x 750m³/h



OceanSaver main locations

- Head Office in Drammen
- Seaside laboratory in the Oslo fjord
- Filter test facility Gdansk Poland



Worldwide Network



OceanSaver compliance

- IMO Type Approval by DNV / The Norwegian Maritime Directorate
- Class Approval by DNV
- Compliant for gas hazardous areas (Pump room & Deck installation)
- According to IMO PSPC intentions
 - By paint manufacturers
 - By DNV
- Safe gas handling (DNV approved)



MANAGING RISK



Order references

Vessel type	BWTS Capacity	Orders
VLCC - Mki	2 x 3.000 m3/h Ex	8 Korea (HHI & DSME)
VLCC - Mki	2 x 3.000 m3/h Ex	12 China (DSIC & SWS)
VLCC - MkII	2 x 3.000 m3/h Ex	2 China (RSHI)
Suezmax - Mki	2 x 2.500 m3/h Ex	2 Korea (HHI)
Suezmax - MkII	2 x 2.500 m3/h Ex	2 China (Bohai)
35' DWT Bulker – MkII	2 x 800 m3/h	4 Korea (SPP)
Chemical tanker - MkII	2 x 750 m3/h Ex sub	2 Korea (HMD)
162K LNG/C – MkII	2 x 2.700m3/h	2 Korea (HHI)
72' DWT Bulker - MkII	1 x 1.200m3/h	4 Japan (Oshima)
Car Carrier (PCTC) – Mki	2 x 600 m3/h	1 Rerofit system installed & DNV approved
PCTC / LNG/C open contract - MkII	2 x 600 m3/h or 2 x 3.000 m3/h	9 retrofit systems (Norwegian owner)
Total		48 systems
Commissioned		9 systems

OceanSaver Mark II BWTS

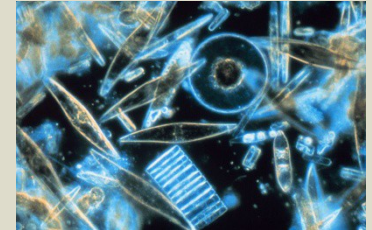


Mark II achievements:

	New System	Old System
Additional ballast pump pressure	0.5-1.0 bar	3.5 bar
Total power consumption (BWT system + ballast pumps)	Reduced by 50 - 60 % compared to old system	
Installation complexity	Significantly reduced as number of components are decreased	
Total investment cost (BWT system + yard installation cost)	Reduced by 50% due to reduced number of components and simplified installation	
Certification	IMO Type Approval Norway/DNV, Ex proof (DNV), PSPC compliant	

Why filtration?

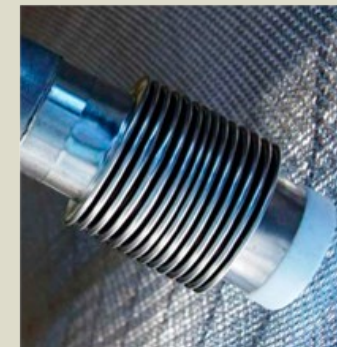
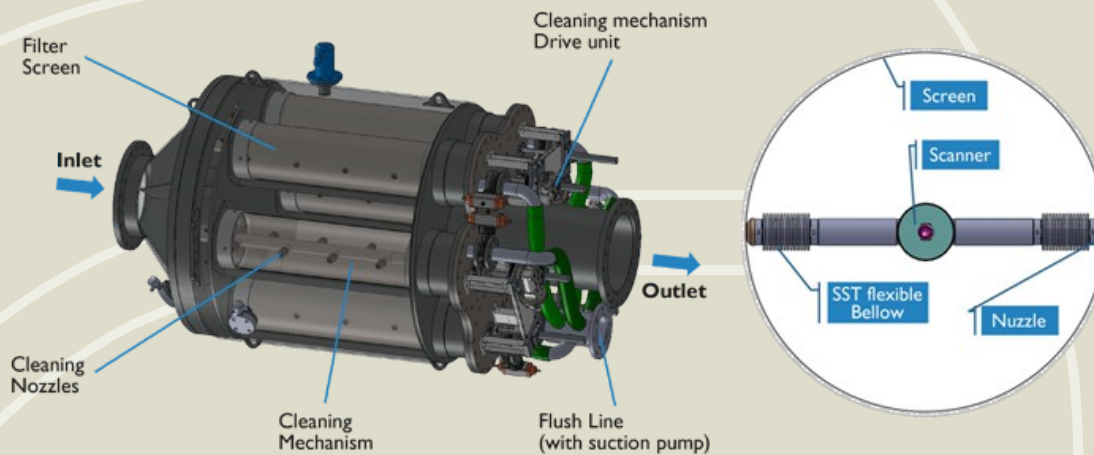
- Reduction of organic matter present in ballastwater
 - > 50 micron = Zooplankton
 - 10-50 micron = Phytoplankton
- Reduction of sedimentation in ballast tanks
- With efficient filtration, the disinfection phase may be optimized
 - Decreased amount of disinfectant required
- Filtration gives you control of the organic load and increase port state compliance

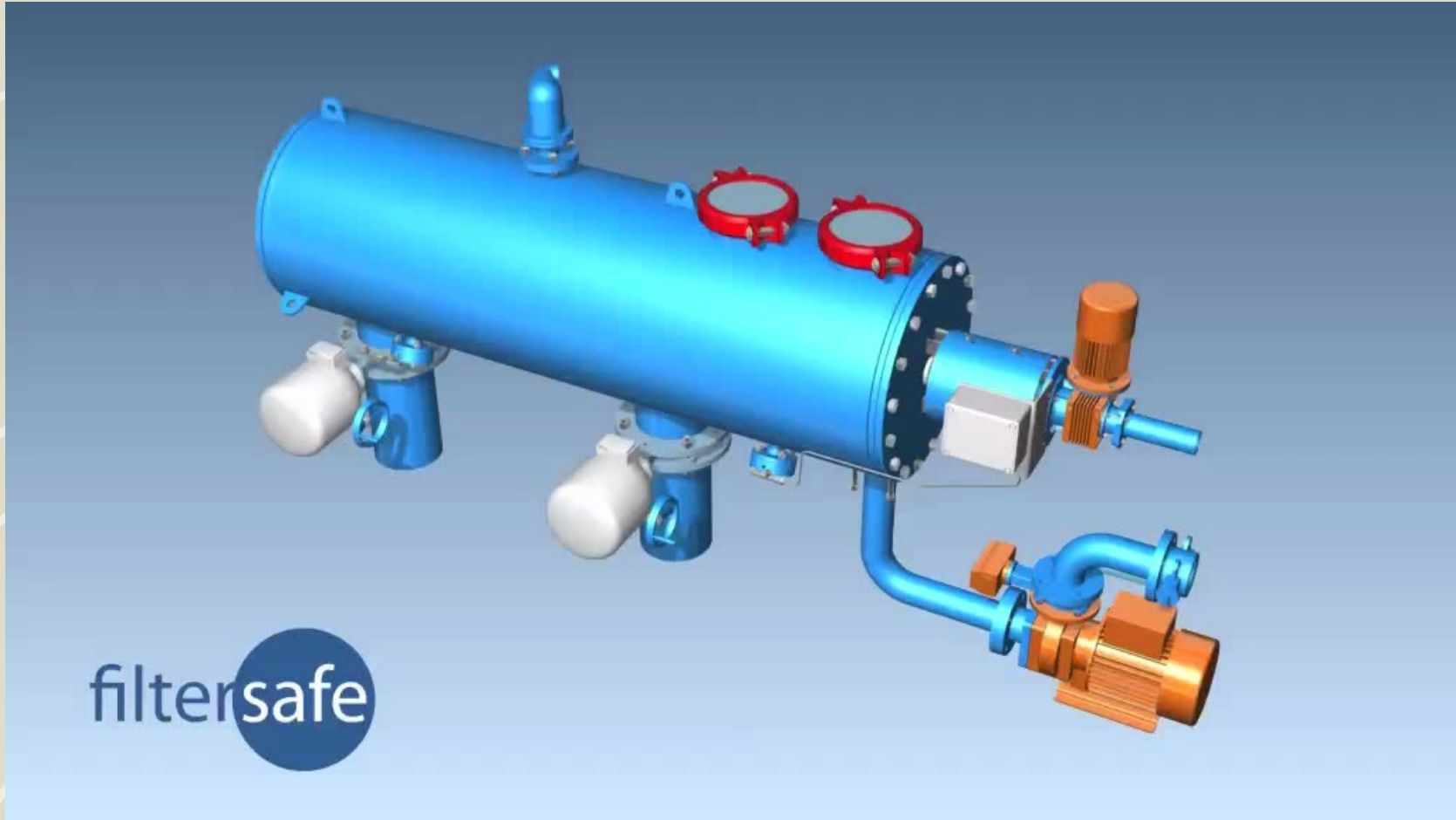


Filtration technology

Ballast water is pumped onboard by the ballast pumps and filtered by a mechanical, fully automatic back-flushing filter. The filter is an automatic self cleaning filter equipped with a 40 micrometer screen. The filter will remove 99,5 % of the organic load above 40 micrometer.

The filter is used at uptake and will when in use, automatically backflush all organic material back to the same water as where it has taken up by the ballast pumps. The filter is electrically or hydraulic driven.





filtersafe

Disinfectant technology (C2E Unit)



C2E Disinfectant skid
3.000 m³/h BWTS

Disinfectant

OceanSaver patented Membrane Cell Technology

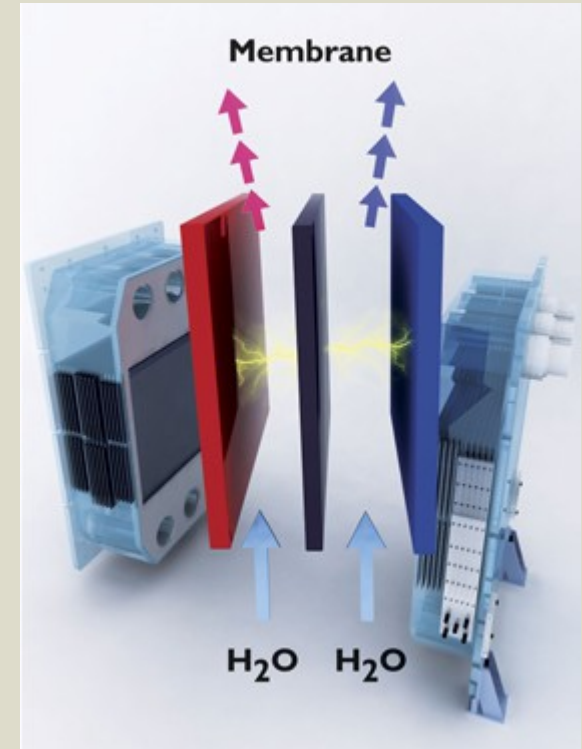
An anolyte produced in the membrane cell is injected into the ballast water, oxidizing organic matter present in the ballast water

The oxidants have a very short half time, and are consumed rapidly during the process of eliminating unwanted species

The TRO level is reduced from 2.5 mg/L to 0.2 mg/L (discharge limit set out by IMO) within a few hours, making neutralization a contingency

Disinfection (C2E unit)

- Oxidant produced onboard without consumables
- Patented membrane cell technology
- Extremely efficient – maximum level 2.5 ppm
- Rapid decay of TRO level– half time 30 mins
- Generated oxidant: Hypobromeous species
- Dosage level self-adjusted by TRO sensors

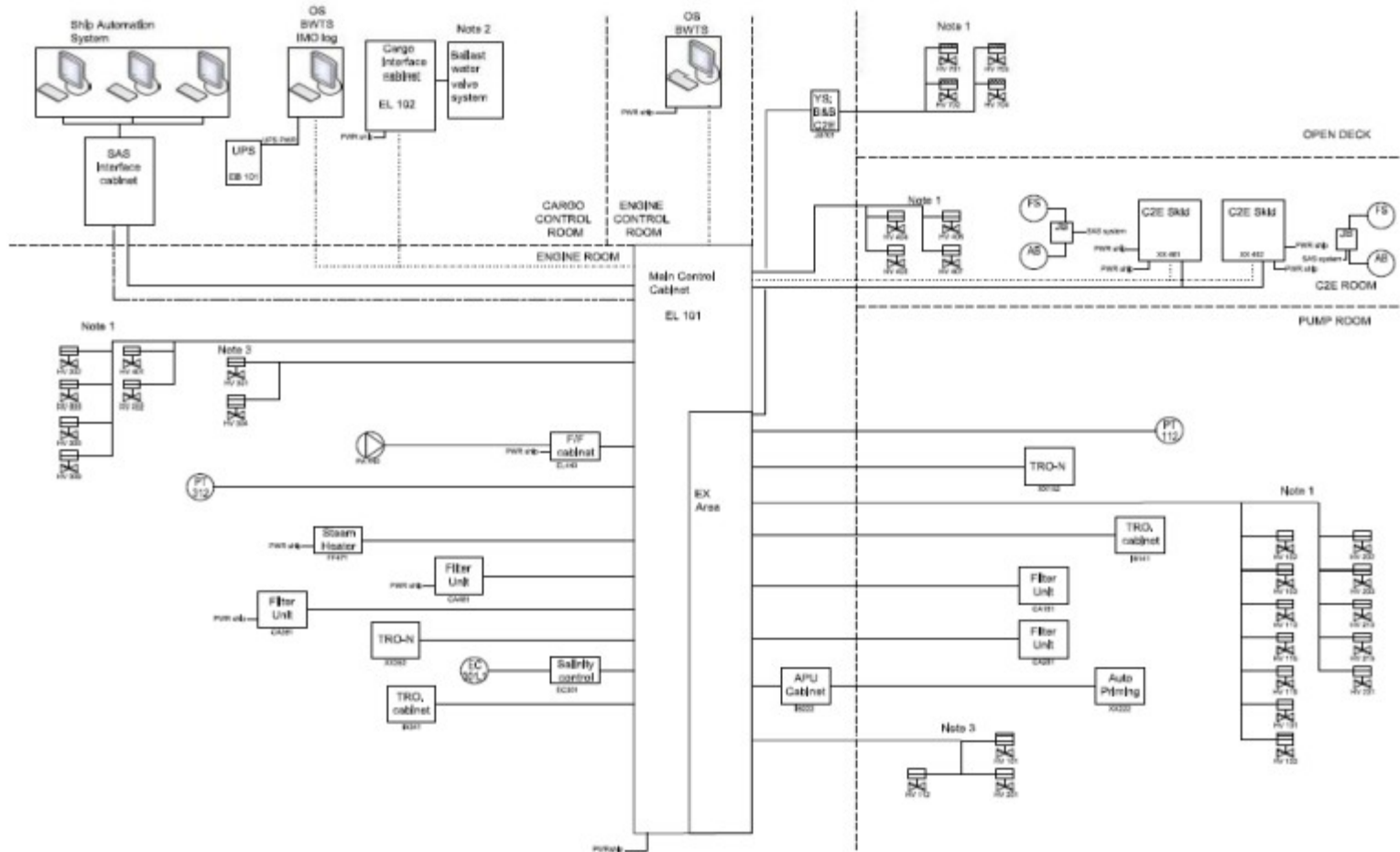


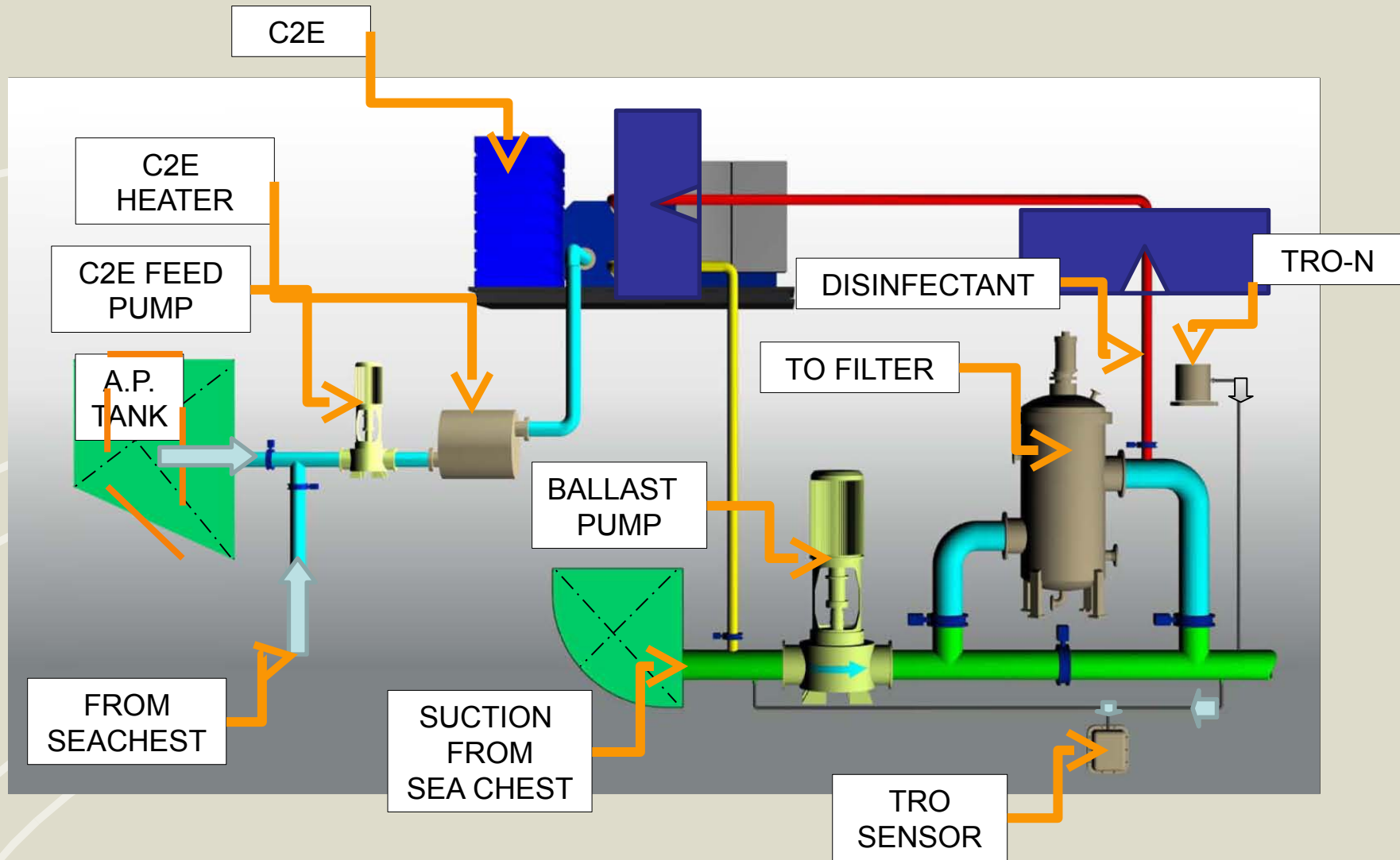
De-ballasting

Gravity
discharge

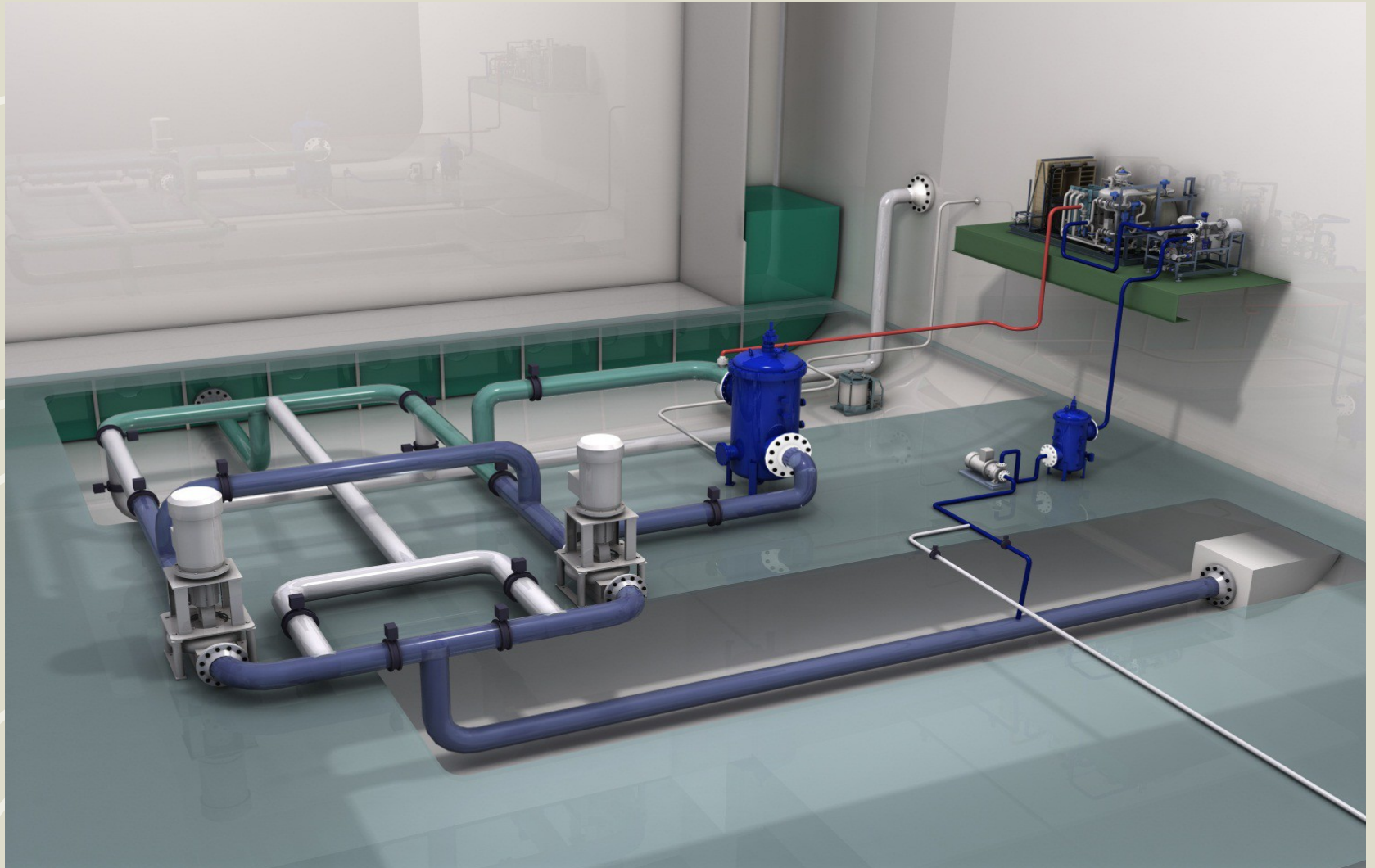


Automation & Monitoring

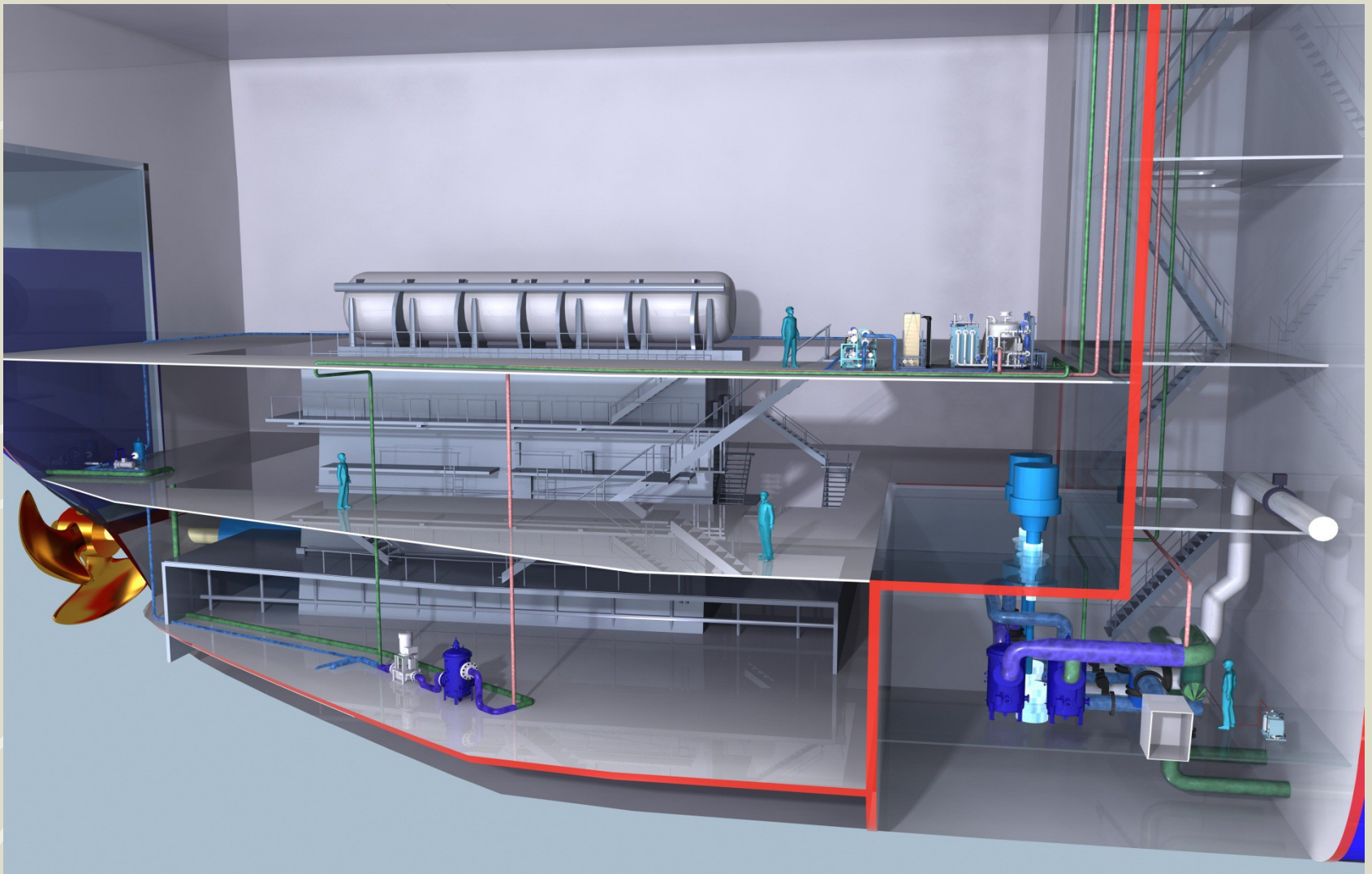




Principle layout Bulk Carrier / LNG Carrier



Principle layout Crude Oil Tanker



OPEX 2 x 1.000 m³/h

- **Based on:**
 - **Normal SW conditions**
 - **BWTS power requirement 140 Kw**
 - **Ballast pump additional power requirement 40 Kw each**
- **OPEX cost ballast system + ballast pump = 0.0112 USD/m³**
- **El-power production cost 0.102 USD / Kw.**

Footprint, Power 2 x 1.000 m³/h

- **Footprint:**
 - **Filter: 1.2 m²**
 - **Disinfectant unit: 6.4 m²**
 - **Total: 13 m², remotely installed in engine room**
- **Power requirement:, during ballast intake only**
 - **BWTS, design: 250 Kw**
 - **BWTS, normal operation: 140 Kw**

Corrosion assessment Mark II

- Initiated January 2011, following up the extensive 3rd party corrosion testing carried out for the Mark I system
- Uncoated coupons / marine epoxy coated coupons
- In cooperation with DNV
- Duration: 6 and 12months;
- Based on PSPC Crossover test (2 week ballast/ 1 week empty)



Option: N2 super saturation

Reduced corrosion and oxidation of ballast tank coating

The Nitrogen super saturation reduces Oxygen level in the ballast water from typically 7-8% to less than 2%

This leads to reduced creep corrosion on exposed steel, and extended lifetime of the ballast tank coatings

During the shipboard test carried out over 12 months and land based test carried out over 6 months, a reduction of anodes of up to 15% was measured

The N2 option consists of an air compressor, N2 generator and a gas mixing unit, all of which are fully integrated into the OS BWTS automation system

BWT SYSTEMS FOR LARGE VESSELS

➤ **COT > 100.000 DWT**



➤ **LNG Carrier**



➤ **BULKERS > 80.000 DWT**



A lot of challenges are lurking below the surface!

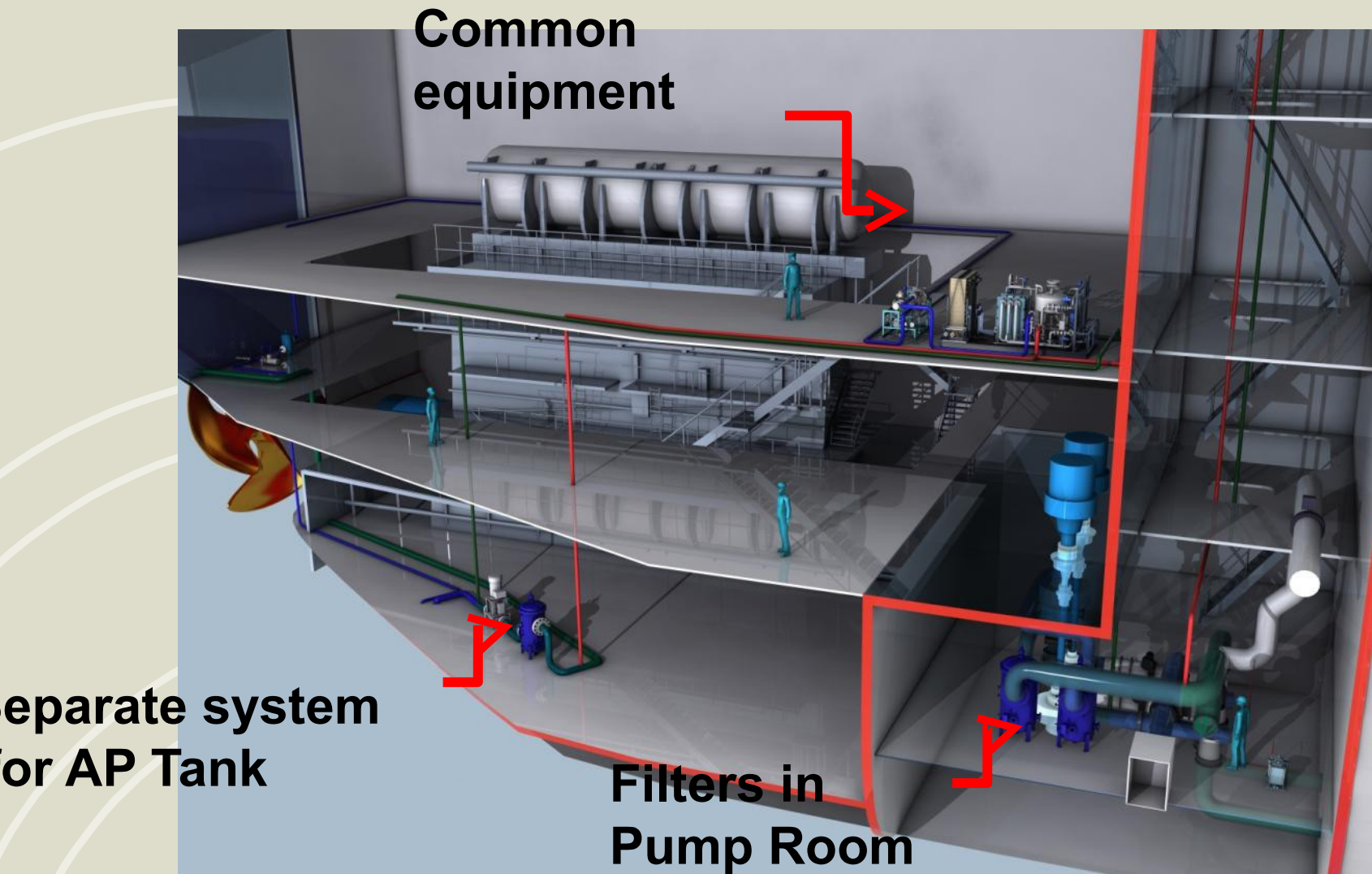


- **BWTS Capacity**
- **Type Approval**
- **Power consumption**
- **Need for neutralizer?**
- **Pressure drop**
- **Operational costs**
- **Technology limitations**
- **Class Approval**
- **Ex approval**
- **Corrosion challenges**
- **Space requirements**
- **Shipyard agenda**

CHALLENGES OF INSTALLING BWT SYSTEMS ON LARGE VESSELS AT DIFFERENT STAGES

- **Sales / Quotation**
 - ✓ **Space for equipment and piping**
 - ✓ **Power available on board**
- **Design / Preparations**
 - ✓ **Surveys**
 - ✓ **Documentation & Prefabrication**
 - ✓ **MSB modifications & Sub-centrals**
- **Installation**

PRINCIPLE LAYOUT TANKER WITH PUMP ROOM



SALES / QUOTATION

✓ Space for equipment and piping

GA BWT preliminary plan

- Vessels with pump room need remote location of equipment
- Location of equipment determined by available space AND piping/cable lengths

Skid mounted BWT

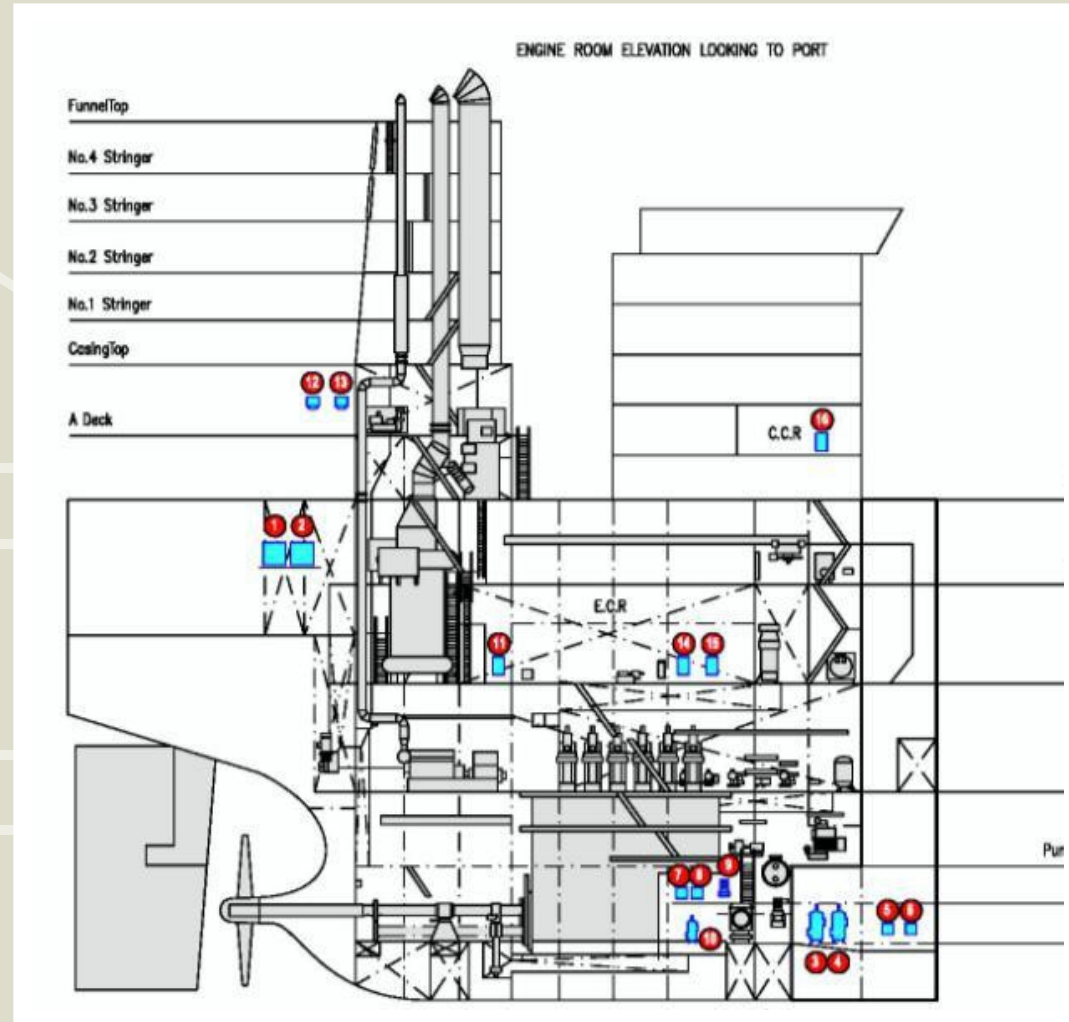
- 10m x 10m for VLCC
- In a new deckhouse

Component mounted BWT

- 40m² for VLCC
- Local and remote location

Others

- Additional 150m DN600



SALES / QUOTATION

✓ Power available on board

ELEC. POWER LOAD

ANALYSIS

- To be done before BWT selection
- All generators to be in operation
- BWT system should adjust power consumption acc. to water quality.

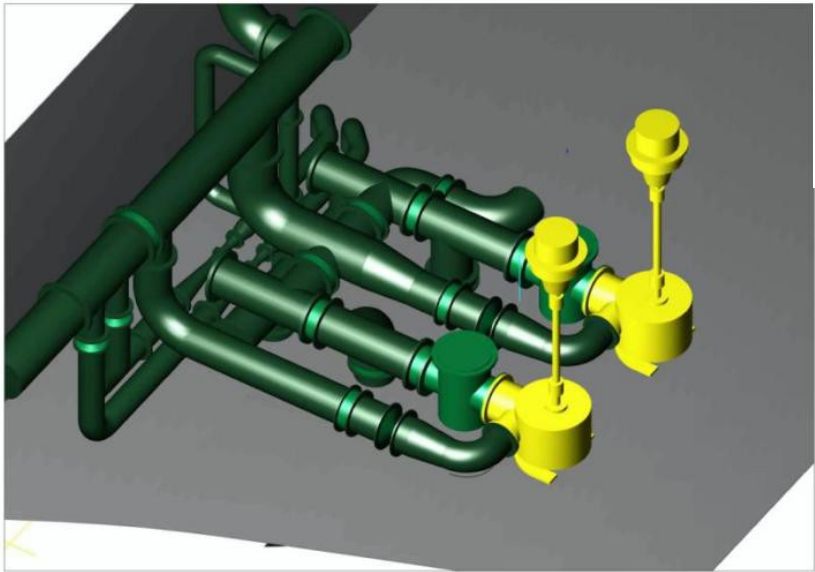
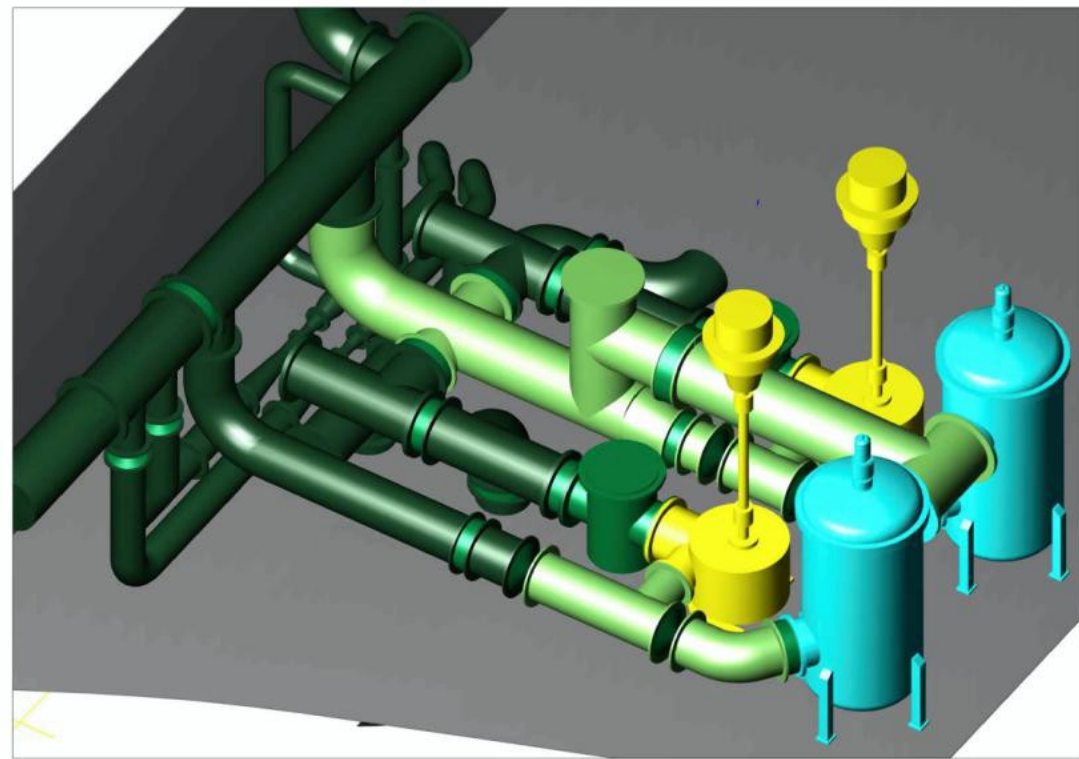
VI	BWT POWER CONSUMPTION 75%	338	413	364	176	413
BALLA						
	GENERATORS IN USE	3	3	3	3	3
GEN.						
	LOAD FACTOR WITH BWT	66%	51%	69%	58%	67%
NO.						
TOT.	BWT POWER CONSUMPTION 50%	225	275	242,5	117,5	275
GENA						
	GENERATORS IN USE	3	2	3	2	3
LOAD						
	LOAD FACTOR WITH BWT	63%	71%	64%	84%	63%
BWT						
CONS	BWT POWER CONSUMPTION 25%	113	138	121	59	138
GENA						
	GENERATORS IN USE	2	2	2	2	2
LOAD						
WI...	LOAD FACTOR WITH BWT	89%	66%	87%	80%	89%

DESIGN / PREPARATION

✓ Surveys, Documentation & Prefabrication

LOCATION OF BWT COMPONENTS IN PUMP ROOM

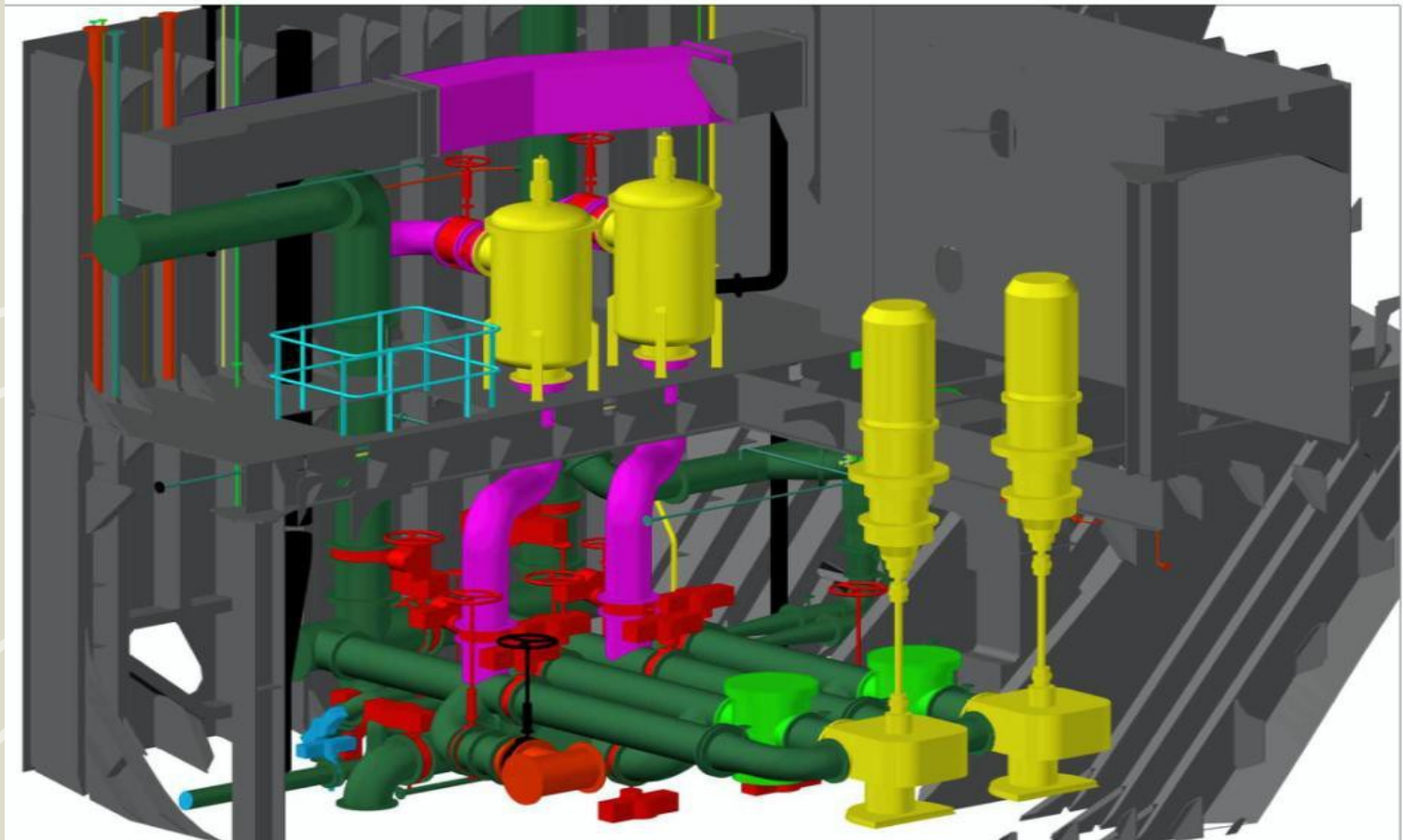
- Very limited space
- Conventional measurements may not be sufficient
- Need for as built drawings
- 3D scanning



DESIGN / PREPARATIONS

- ✓ Surveys, Documentation & Prefabrication

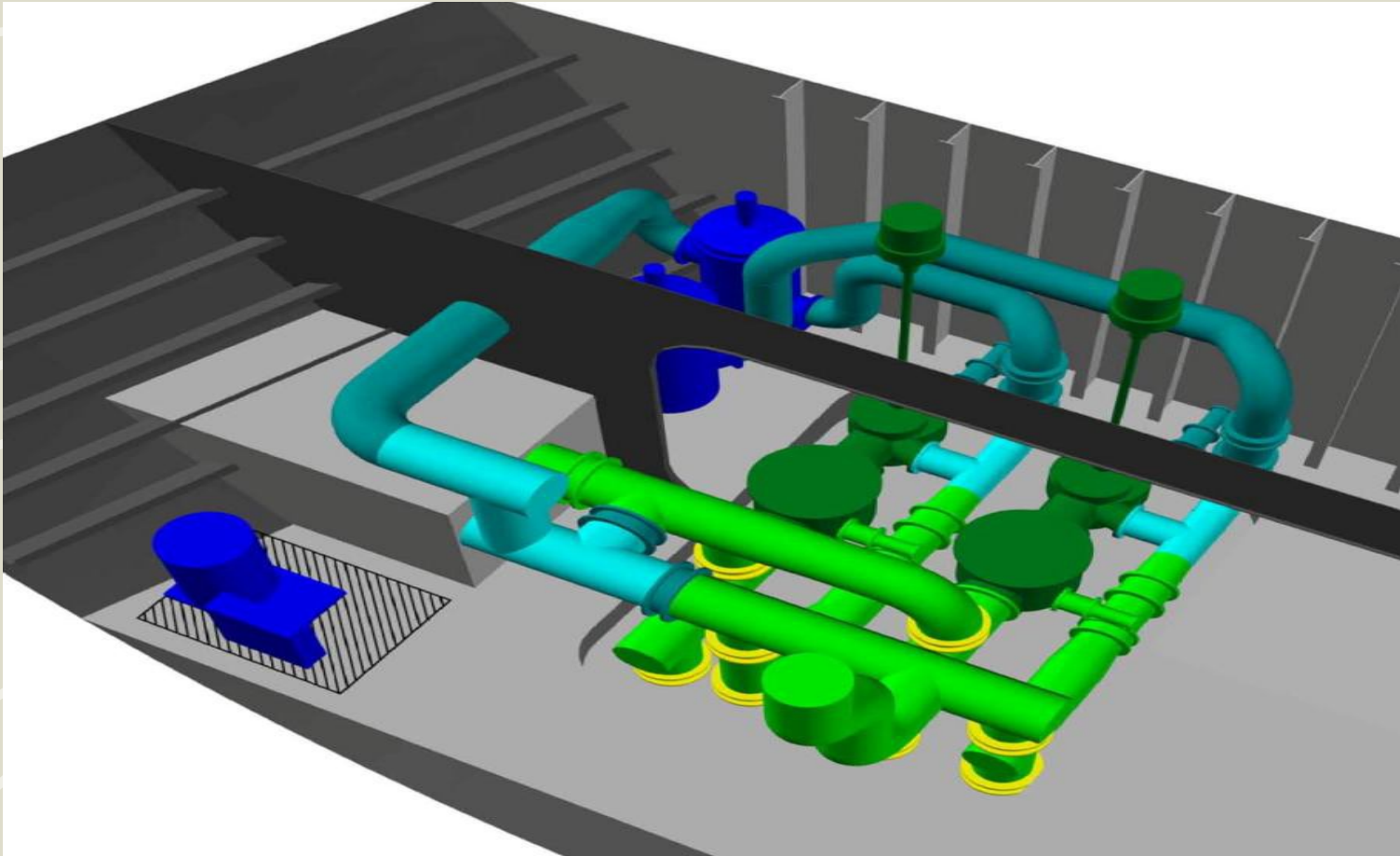
LOCATION OF BWT COMPONENTS IN PUMP ROOM



➤ DESIGN / PREPARATIONS

- ✓ Surveys, Documentation & Prefabrication

LOCATION OF BWT COMPONENTS IN PUMP ROOM

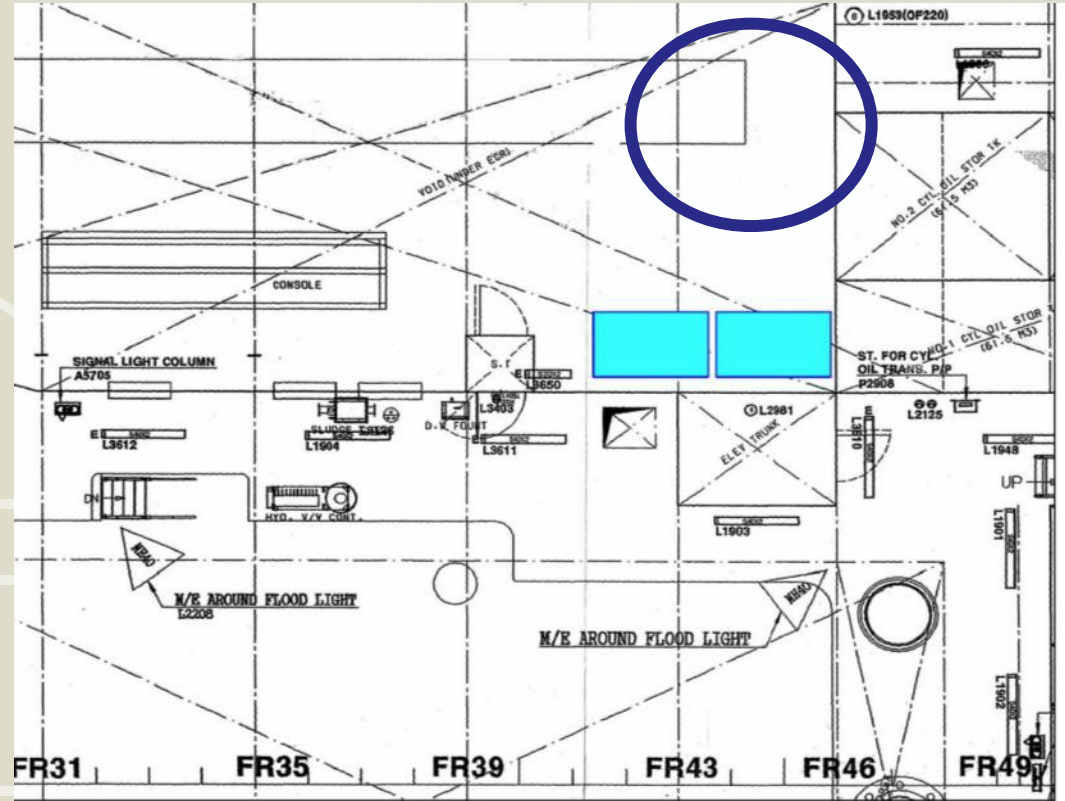


DESIGN / PREPARATIONS

Main Switch Board modifications & Sub-Centrals

VLCC • 500kW for BWT

- 1250 A Fuses for 500kW BWT system
- Space in Main Switchboard
- MSB – challenge to extend space in ECR
 - space in ECR



H	P03004	G/E NO.2 PRELUB. PUMP	HiBL-103NT	15	T2
H	P03005	SPARE FOR G/E COOLING WATER PREHEATING UNIT	HiBL-403	75	T35
H	P03006	SPARE	HiBL-403	250	

INSTALLATION

- ✓ Handling of heavy equipment
- ✓ Pipes max 70% prefabrication

VLCC


- 30% of piping has to be done on board
- 8 tons of piping

Connections to equipment and interfaces with existing piping will require high quality of prefabrication and time consuming on-site adjustments.



➤ Electrical installation (cables)

- **Substantial amount of additional cables for VLCC > 3km**
- **Power cables for main treatment units ▪ 3 x (1 x 3 x 95mm²)**
- **Some of BWT components can't be located near to MSBD**

Cable mm ²	km
2 x 1,5	1,15
2 x 2,5	0,08
2 x 25	0,03
3 x 1,5	0,04
3 x 2,5	0,07
3 x 25	0,05
3 x 95	0,15
2 x 2 x 0,75	1,2
4 x 2 x 0,75	0,05
10 x 2 x 0,75	0,12
24 x 2 x 0,78	0,1
	3,1

INSTALLATION

- ✓ Handling of heavy equipment,
 - ✓ Pipes, max 70% prefabrication
 - ✓ Long cables
-
- Heights between decks in Pump Rooms proper scaffolding
 - Correct planning of lifting eyes for future service and maintenance
 - Adding a single valve DN600 or sensors after prefabrication can be challenging

