

# BIO-SEA

## The French system







# European leader in UV water disinfection systems

Founded in 2000, Based in South of France

Public company listed in Euronext Growth Paris.















Since its creation, the BIO-UV  
Group has equipped more than:







Automatic chlorine-free treatment in private facilities



Disinfection and dechloramination in collective swimming pools & spas

Purification of fresh or salt water in aquariums



Domestic and urban water purification

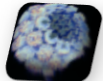


Treatment of waste water which is reused or not



Disinfection of water from industrial processes and ultra-pure water

Treatment of Legionella



Treatment of ship ballast water: BIO-SEA



Snow-making machines

...



## BIO-UV environmental UV treatment solutions



**Ballast Water**



**REUSE**



**Drinking water**



**Grey waters**



**Legionella**



**Pools & Spas**







# **BWTS** **TECHNOLOGIES**



### Physical solid-liquid separation

#### Treatment:

- Hydrocyclone
- Surface filtration

Chemical  
enhancement:

- Coagulation/  
Flocculation



### Disinfection

#### Chemical treatment:

- Chlorination
- Electrochlorination  
or electrolysis
- Ozonation
- Peracetic acid
- SeaKleen
- Chlorine dioxide

OR

#### Physical

- UV irradiation
- UV + TiO<sub>2</sub>
- Deoxygenation
- Gas injection
- Ultrasonic treatment
- Cavitation
- Heat

#### Residual control:

- Chemical reduction  
(sulphite/bisulphite)

#### Physical enhancement:

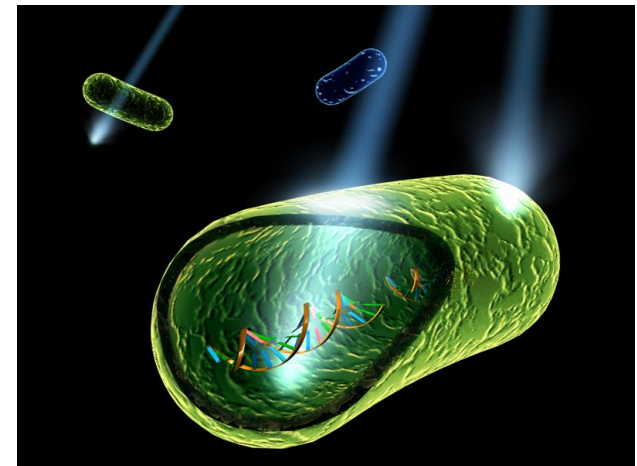
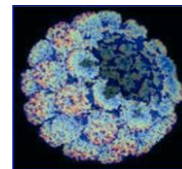
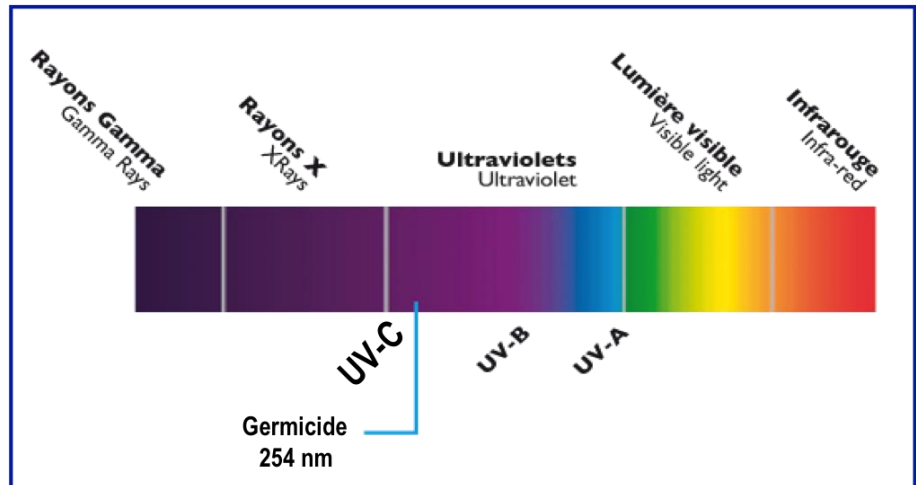
- Ultrasonic  
treatment
- Cavitation





## THE UV C ACTION

- The sun emits an invisible light: ultraviolet light.
- This natural phenomenon is reproduced thanks to lamps of different types (low pressure or medium pressure) that emit UV-C rays.
- UV-C radiation acts upon: bacteria, mould, yeasts, algae, legionella, viruses ...
- UV-C radiation at 254nm penetrates into the heart of the cells of micro-organisms and disturbs their metabolism until they are totally destroyed (inactivation), they cannot then reproduce.



### UV TECHNOLOGY

- ✓ Well proven technology,
- ✓ Not impacted by water salinity,
- ✓ Not impacted by water temperature ,
- ✓ Tested at low water transmittance,
- ✓ Safe: Chemical free, no explosive gas, no induced corrosion in the pipe nor in the ballast tanks, no active substances,
- ✓ Automatic regulation of power consumption,
- ✓ Warning of the UV performance => enough UV doze?!!
- ✓ Warning on the filter performance.



### ELECTRO CHLORINATION TECHNOLOGY

- ✓ Well proven technology,
- ✓ Impacted by salinity,
- ✓ Impacted by water temperature ,
- ✓ Explosive gas,
- ✓ Potential induced corrosion in the pipe or in the ballast tanks,
- ✓ Need to neutralize chlorine before discharge if the level is above the accepted limit,
- ✓ Warning with low salt or temperature level → water ballast management headache for the crew...



**TWO**

# **BALLAST WATER MANAGEMENT REGULATIONS**





**IMO regulation is already in force for NB**

**For existing ships compliance starts  
in September 2019**

**From September 2019 to September 2024**



## USCG regulation is already in force

### 3 choices

*Use tap water from US national domestic water*

*Don't discharge in US waters*

*Install an USCG Type approved system*



# Marine Safety Center BWMS Type Approval Status



<i>Approved</i>						
Application Received	Manufacturer (Country)	Model	Independent Laboratory	System Type	Capacity	Certificate Issued* (Amended)
20 Sep 2016	Optimoxin (Norway)	OBS/OBS Ex	DNV GL	Filtration + Ultraviolet	167 – 3,000 m <sup>3</sup> /h	02 Dec 2016 (03 Nov 2017)
21 Sep 2016	Alfa Laval (Sweden)	PureBallast 3	DNV GL	Filtration + Ultraviolet	150 – 3,000 m <sup>3</sup> /h	23 Dec 2016 (21 Dec 2017)
23 Sep 2016	TeamTec OceanSaver AS (Norway)	OceanSaver MK II	DNV GL	Filtration + Electrodialysis	200 – 7,200 m <sup>3</sup> /h	23 Dec 2016 (18 Oct 2017)
24 Jan 2017	Suzui (China)	BalClor	DNV GL	Filtration + Electrolysis	50 – 8,500 m <sup>3</sup> /h	06 Jun 2017 (05 Jan 2018)
31 Mar 2017	Ecochlor, Inc. (USA)	Ecochlor BWTS	DNV GL	Filtration + Chemical Injection	500 – 16,200 m <sup>3</sup> /h	10 Aug 2017 (26 Apr 2018)
02 May 2017	ERMA FIRST (Greece)	Erma First FIT	Lloyd's Register	Filtration + Electrolysis	100 – 3,740 m <sup>3</sup> /h	18 Oct 2017 (25 Sep 2018)
31 Oct 2017	Techcross, Inc. (Republic of Korea)	Electro-Clean	Korean Register	Electrolysis	150 – 12,000 m <sup>3</sup> /h	05 Jun 2018
28 Sep 2017	Samsung Heavy Industries Co., Ltd (Republic of Korea)	Purimar	Korean Register	Filtration + Electrolysis	250 – 10,000 m <sup>3</sup> /h	15 Jun 2018 (20 Jul 2018)
12 Mar 2018	BIO-UV Group (France)	BIO-SEA B	DNV GL	Filtration + Ultraviolet	55 – 1,400 m <sup>3</sup> /h	20 Jun 2018
09 Apr 2018	Wärtsilä Water Systems, Ltd. (UK)	Aquarius EC	DNV GL	Filtration + Electrolysis	250 – 4,000 m <sup>3</sup> /h	30 Aug 2018





## *Marine Safety Center BWMS Type Approval Status*



### *Under Review*

Application Received	Manufacturer (Country)	Model	Independent Laboratory	System Type	Capacity	Certificate Issued* (Amended)
03 Mar 2018	De Nora (USA)	BALPURE	Lloyd's Register	Filtration + Electrolysis	400 – 7,500 m <sup>3</sup> /h	Pending
16 Mar 2018	Alfa Laval (Sweden)	PureBallast 3	DNV GL	Filtration + Ultraviolet	150 – 3,000 m <sup>3</sup> /h	23 Dec 2016 (21 Dec 2017)
22 Mar 2018	Optimarin (Norway)	OBS/OBS Ex	DNV GL	Filtration + Ultraviolet	167 – 3,000 m <sup>3</sup> /h	02 Dec 2016 (03 Nov 2017)
29 Mar 2018	JFE Engineering Corporation (Japan)	BallastAce	Control Union	Filtration + Chemical Dosing	500 – 3,500 m <sup>3</sup> /h	Pending
30 Mar 2018	Panacea Co., Ltd. (Republic of Korea)	GloEn-Patrol	DNV GL	Filtration + Ultraviolet	50 – 6,000 m <sup>3</sup> /h	Pending
09 May 2018	Headway Technology Co., Ltd. (People's Republic of China)	OceanGuard	DNV GL	Filtration + Electrolysis	65 – 5,200 m <sup>3</sup> /h	Pending
31 May 2018	Hyundai Heavy Industries Co., Ltd. (Republic of Korea)	HiBallast	DNV GL	Filtration + Electrolysis	75 – 10,000 m <sup>3</sup> /h	Pending
20 Jul 2018	Emircleansa, LLC (USA)	inTank	DNV GL	Electrolysis + Chemical Injection	Up to 200,000 m <sup>3</sup>	Pending
30 Aug 2018	NK BMS Co., Ltd. (Republic of Korea)	NK-O3 BlueBallast II	Lloyd's Register	Ozone	200 – 8,000 m <sup>3</sup> /h	Pending
27 Sep 2018	NK BMS Co., Ltd. (Republic of Korea)	NK-O3 BlueBallast II Plus	Lloyd's Register	Ozone	200 – 8,000 m <sup>3</sup> /h	Pending

\*Some manufacturers have requested multiple amendments to their Type Approval Certificates. The first date is the date when the original certificate was issued, and the date in parentheses is the date of the current amendment. Copies of Type Approval Certificates can be found at <http://www.dco.uscg.mil/mssc/Ballast-Water/TACs/>, or by visiting the USCG Approved Equipment List at: <http://cgmix.uscg.mil/Equipment/Default.aspx>



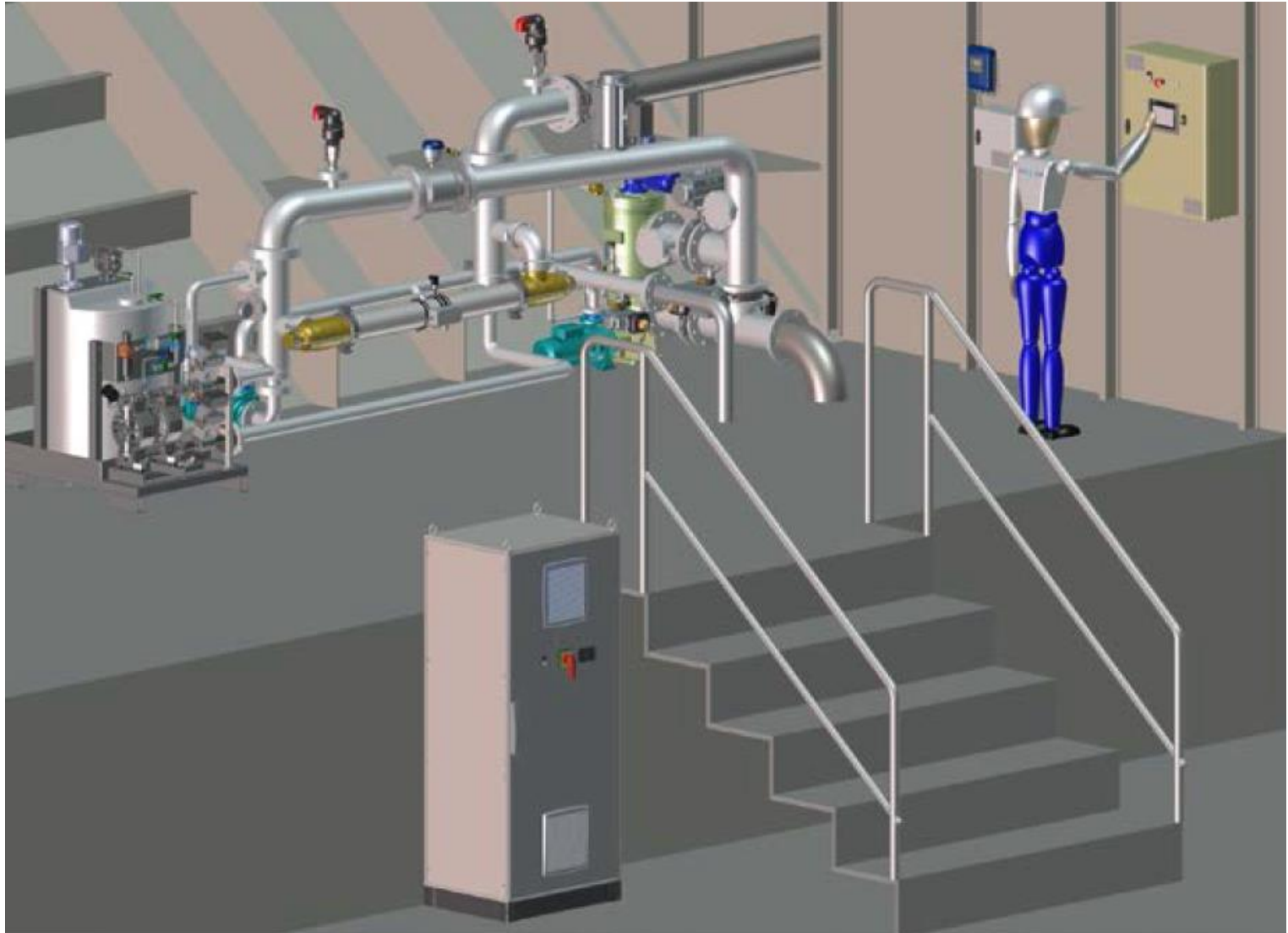
# **BIO SEA is one of the 3 UV MAKERS USCG TYPE APPROVED**

**With the Shortest holding time on the market until today**

- ***0 hours for fresh water => excellent for Great Lakes***
  - ***24 hours for marine water***
  - ***72 hours for brackish water***

**And in 6 months from now BIO SEA will be at least at 0 holding time for the marine and brackish waters**

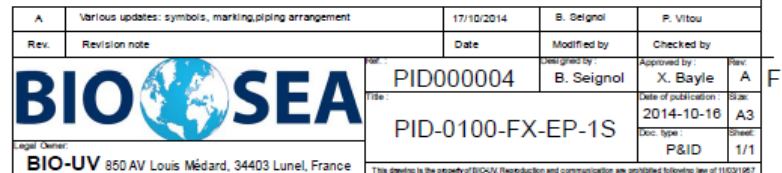
## THE BIO-SEA SYSTEM





## BIO-SEA – SCOPE OF SUPPLY

- UV titanium reactor of 100 / 150 m<sup>3</sup>/h each,
- 1 UV sensor on each reactor, 1 temperature sensor,
- 1 compact screen filter 20 µm with automatic backwash pumps for system cleaning (system & filter backwash),
- Power supply cabinet(s),
- 1 control command cabinet with touch screen interface,
- 1 flow meter,
- 2 manifolds piping galvanized for flow repartition,
- Pneumatic valves, 1 regulating valve,
- 1 conductivity meter,
- Profibus cable (between power cabinets and control cabinet),
- UV lamp cable (between each UV lamp and power cabinets),
- 2 Pressure reducers, for air & fresh water,
- 2 Sampling ports.



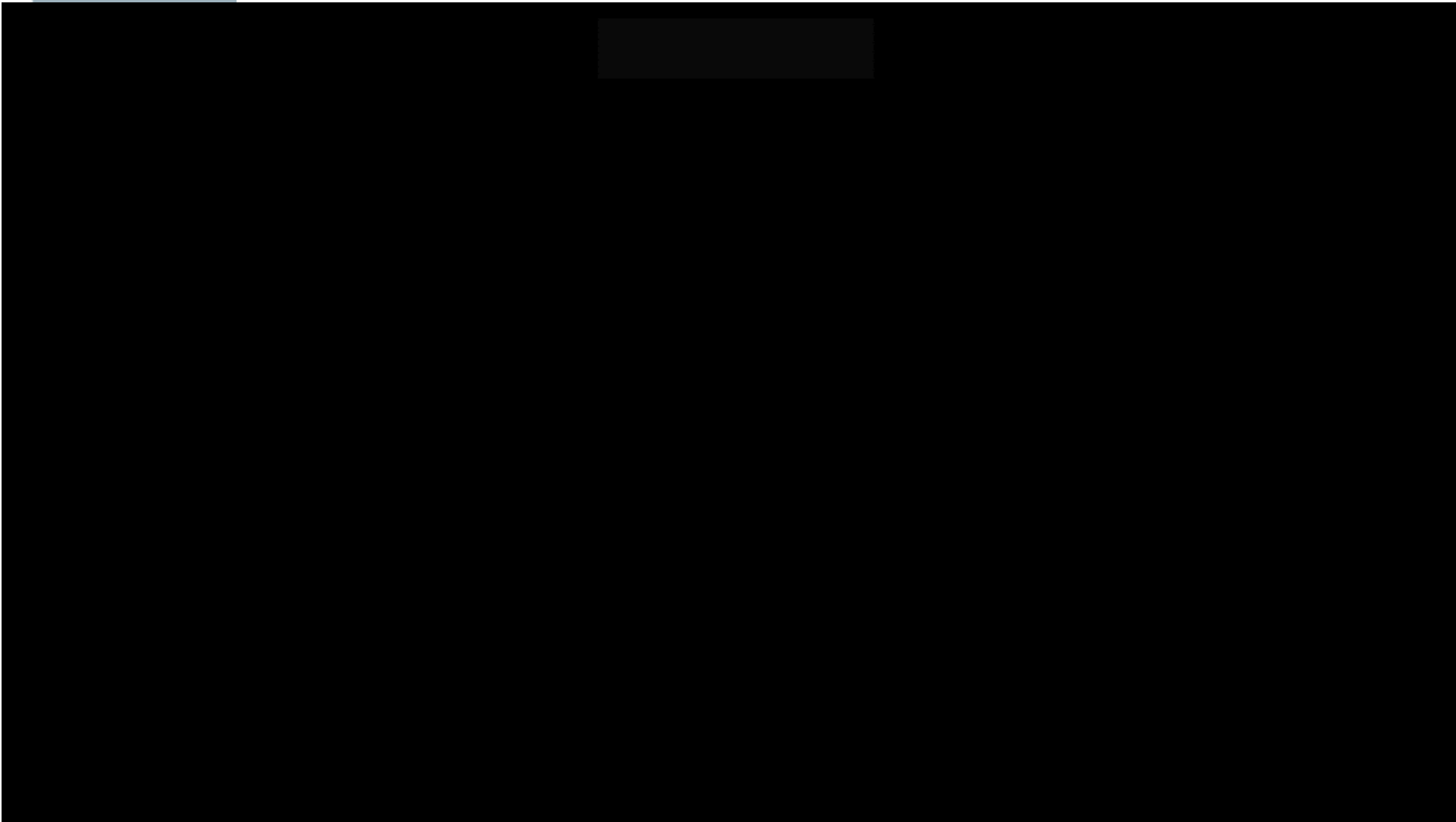
## HOW IT WORKS





**20µm screen retaining** filtering element in duplex, **for suspended solids and zooplankton** (micro-organism size > 50 µm),

- **Size to scale** depending on the flow rate to treat (by increasing the size of the filter or duplicating the housing),
- **Automatic backwash** monitored by a pressure switch,
- **No disruption** of the filtration process during the cleaning cycle, and no significant variation of the treated flow rate,
- **Additional suction pump** to allow a complete cleaning even if the vessel service pressure is low

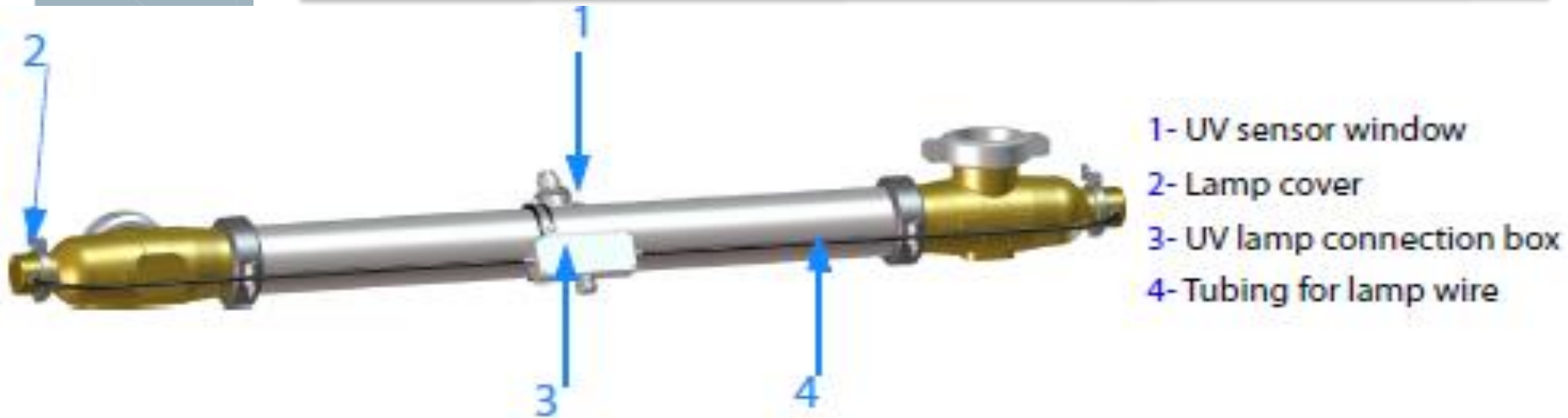


## FILTER RESULTS...





## OUR UV REACTOR



- Reactor are in titanium and bronze aluminum alloy, no coating inside
- Reactor equipped with a **single MP UV lamp**, high intensity – high UV doze
- A high-quality quartz sleeve protects the UV lamp
- **Optimized design** by CFD (Computational Fluid Dynamic), taking into account the seawater quality (UV transmittance) and fluid speeds on the quartz sleeves, in order **to facilitate cleaning and maintenance**
- Lamp driven by **electronic ballast**, allowing precise management of the UV lamp in order to optimize its regulation, **reduce the power consumption and prolong its life**
- Monitoring through UV sensor (intensity)
- **Modular design** facilitates the installation of UV reactors in parallel, for a better **adjustment to the flow** that has to be treated

## ADVANTAGES OF THE BIO-SEA BWTS

- ✓ **Well proven technology,**
- ✓ **Not impacted by salinity nor water temperature ,**
- ✓ **Tested with the best laboratories (DHI, GO Consult, MERK)**
- ✓ **Tested at low water transmittance,**
- ✓ **Safe: Chemical free, no explosive gas, no induced corrosion in the pipe nor in the ballast tanks, no active substances,**
- ✓ **Automatic operation, MMI easy to use,**
- ✓ **Automatic regulation of power consumption,**

## CLASSIFICATION SOCIETIES



**BUREAU  
VERITAS**

**BV Certificate number: 34154/A2 MMF  
BV Class Approval Certificate 34153 A3 BV**



**ABS design assessment 15-GD1245032-PDA**



**GL AIP 14-034573/DUE**



**LR MDAD MTES/ENG/WP16197565**



**USCG Type approved.**

**IMO & USCG TYPE APPROVED**  
**with the same system**

- ***Under IMO mode 150m<sup>3</sup>/UV reactor***
- ***Under USCG mode 100 m<sup>3</sup>/UV reactor***

**For example for a ballast pump of 1000m<sup>3</sup>/h**

**2 operational solutions**

**BIO SEA B04-500**

- *Max flowrate under IMO mode 500 m<sup>3</sup>/h*
- *Max flowrate under USCG mode 400 m<sup>3</sup>/h*

**or**

**BIO SEA B05-500**

- *Max flowrate under IMO mode 500 m<sup>3</sup>/h*
- *Max flowrate under USCG mode 500 m<sup>3</sup>/h*



*A BWTS integration in a New Building project is sometimes difficult...*

*A Retrofit Project could be much more difficult...*

⇒ *Anticipation...*

- ⇒ *For system selection,*
- ⇒ *For system purchasing,*
- ⇒ *For system integration,*
- ⇒ *For Class society approvals...*

⇒ *Good skills,*

⇒ *Good communication,*

⇒ *And a simple system to install...*

## *Time frame...*

*Select the most adapted technologie to your ships*

- *Type of ship,*
- *Ship operations,*
- *Trading area,*
- *How the ballast pumps are used and managed,*
- *1 or 2 pumps run...*
- *Space in the ship to integrate the unit....*

## ***Time frame...***

*Select the technologie the most adapted to your ships,*

### ***Purchase the unit...***

*=>On the shelf?*

*=> or 4 months for system delivery.*

***Engineering phase about 1 month,***

*Onboard survey,*

*3D laser scan ... or not...*

### ***Technical discussions***

*Final drawings, bill of material*

***Class approval,***

***System integration,***

***Commissioning***

***Crew Training...***

# THE BIO-SEA SYSTEMS



CEMRE SHIPYARD



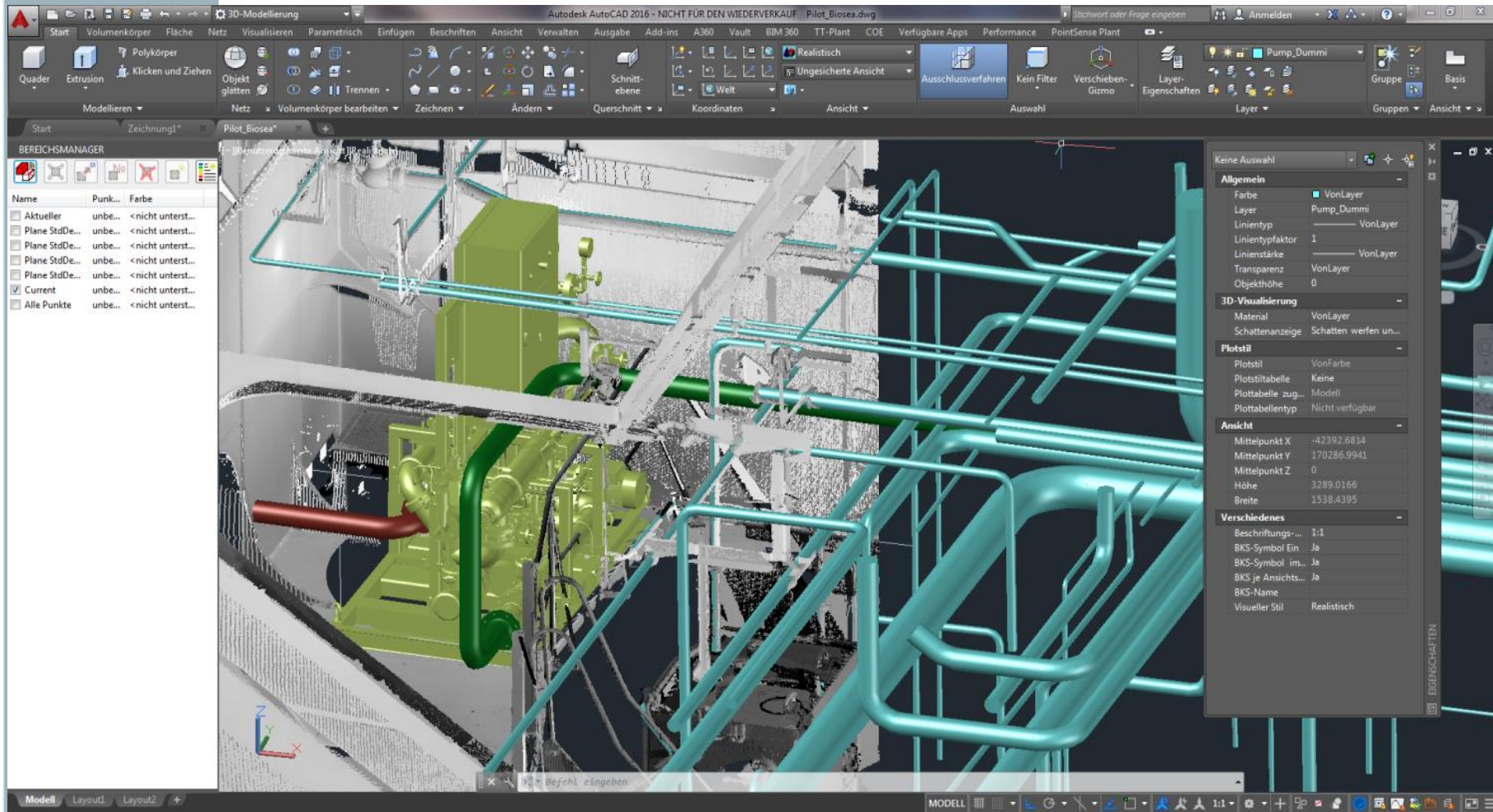
# ***RETROFIT STUDY CASES***





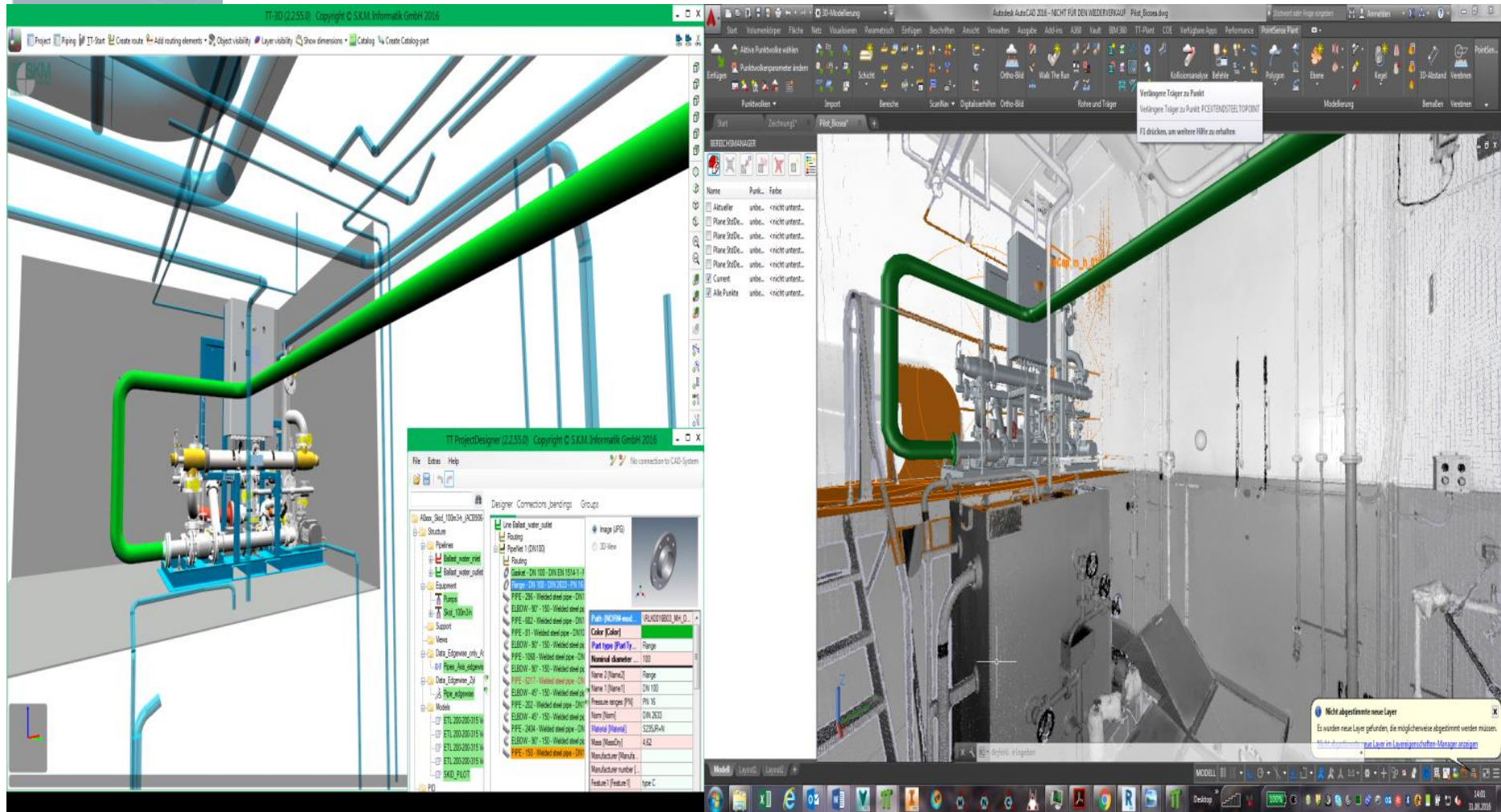
1. SCOPE DEFENITION
2. POSSIBLE SITE SURVEY 3D-LASERSCAN
3. CLOUD ENGINEERING
4. DETAIL ENGINEERING & BOM
5. SYSTEM DEFENITION & BOM
6. INSTALLATION BY FLYING SQUAD
7. COMMISSIONING / CREW TRAINING



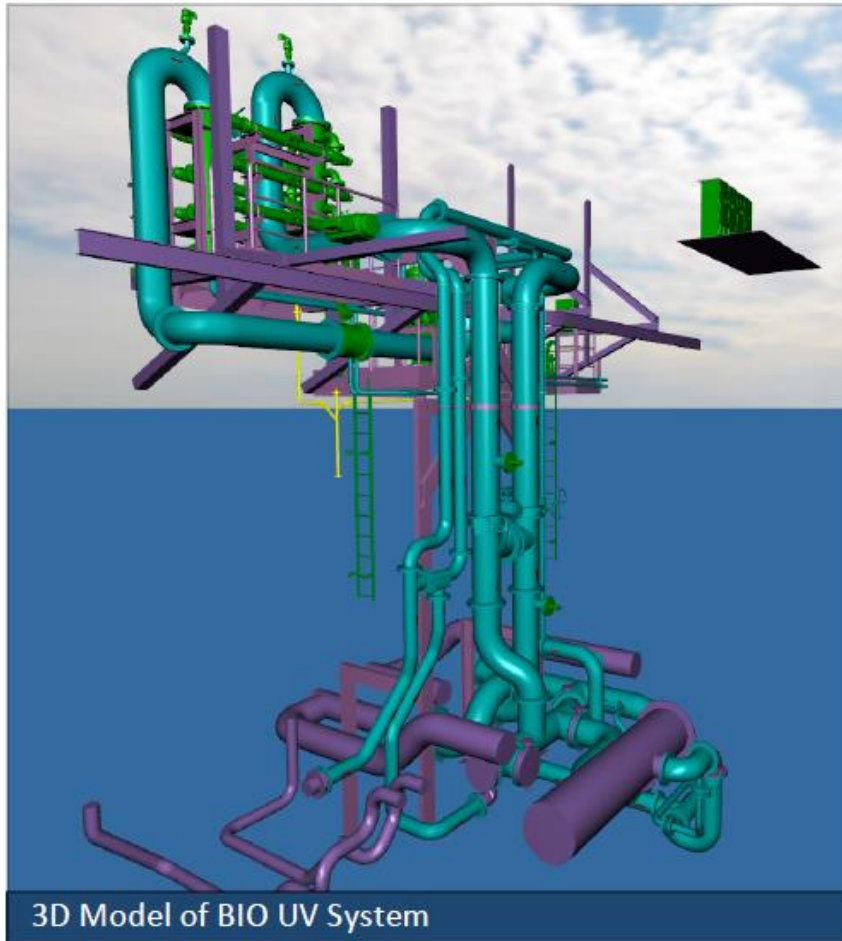




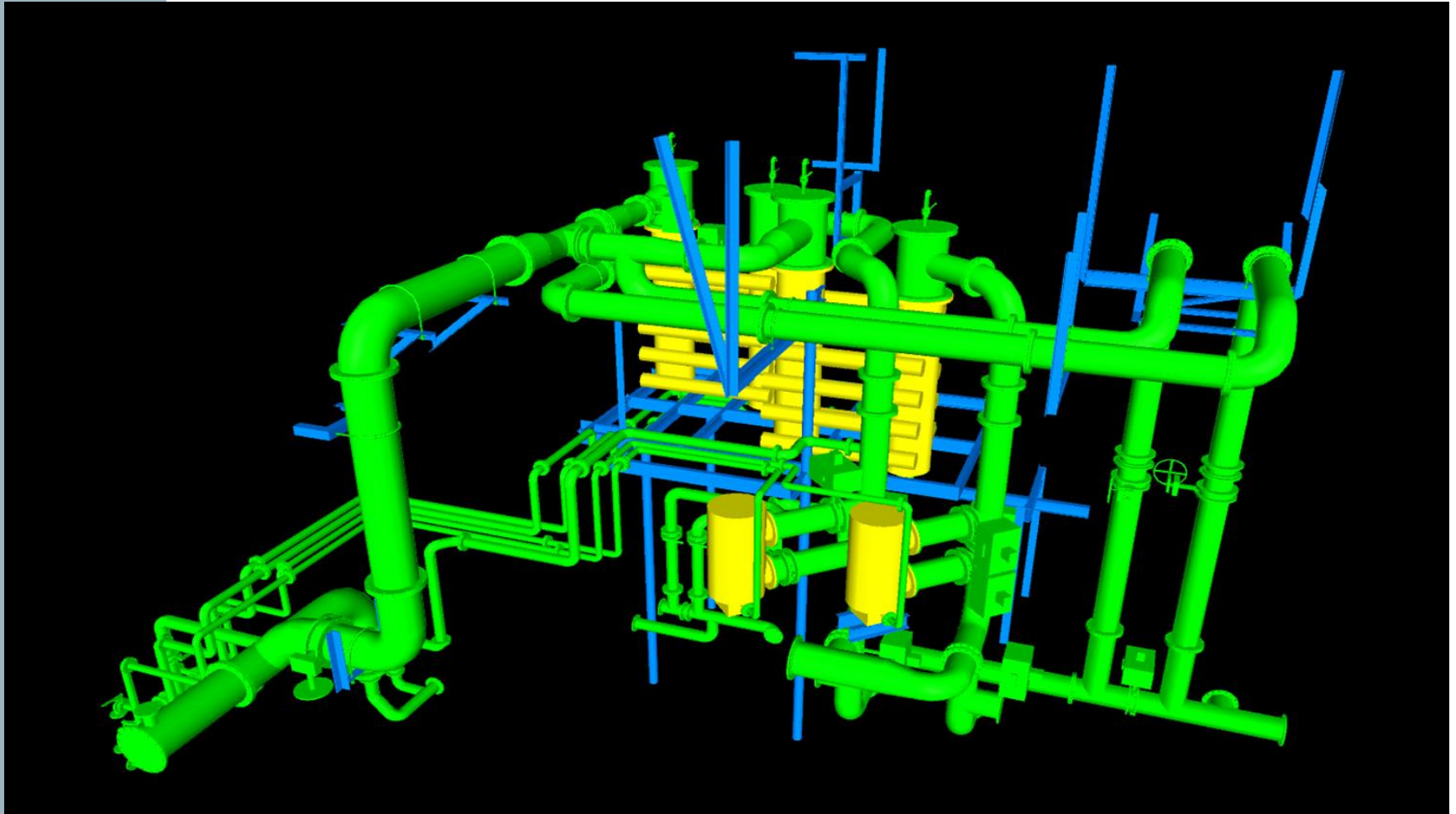
# RETROFITS TURNKEY PROJECTS



# THE BIO-SEA SYSTEM



# THE BIO-SEA SYSTEM





## THE BIO-SEA SYSTEMS



**Retrofit installations during Operations**

**CMA CGM - CENDRILLON**

**BIO SEA 2 X 1000m<sup>3</sup>/h**

## THE BIO-SEA SYSTEMS



## THE BIO-SEA SYSTEMS



**Retrofit Installation at quay**

**La MERIDIONALE**

**GIROLATA- ROPAX**

**BIO SEA 400m<sup>3</sup>/h**

## THE BIO-SEA SYSTEMS





## THE BIO-SEA SYSTEMS





## THE BIO-SEA SYSTEMS



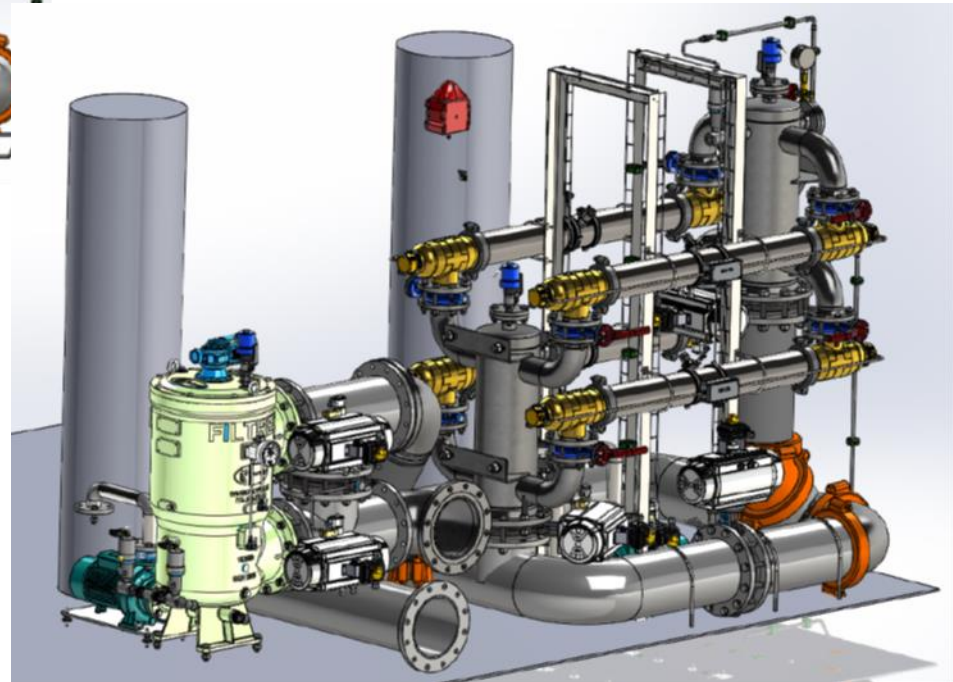
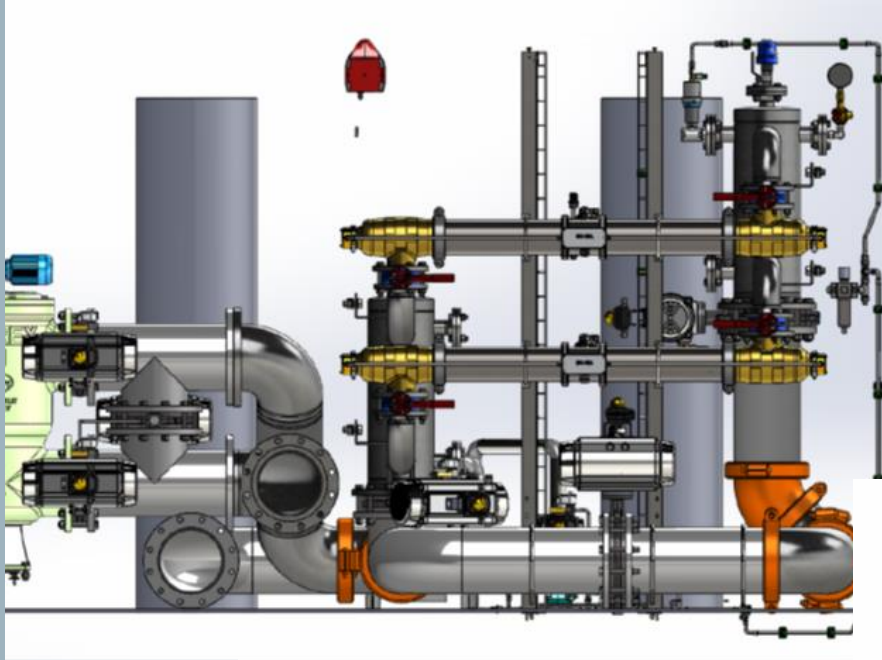
**Retrofit installation**

**LDA RORO**

**City of Hamburg / Ville de Bordeaux/ Ciudad de Cadiz**

**BIO SEA 400m<sup>3</sup>/h**

# THE BIO-SEA SYSTEMS



## THE BIO-SEA SYSTEMS



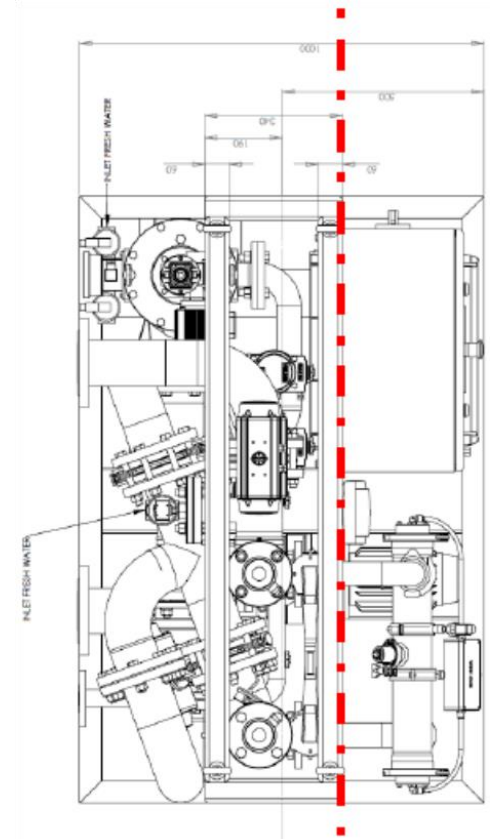
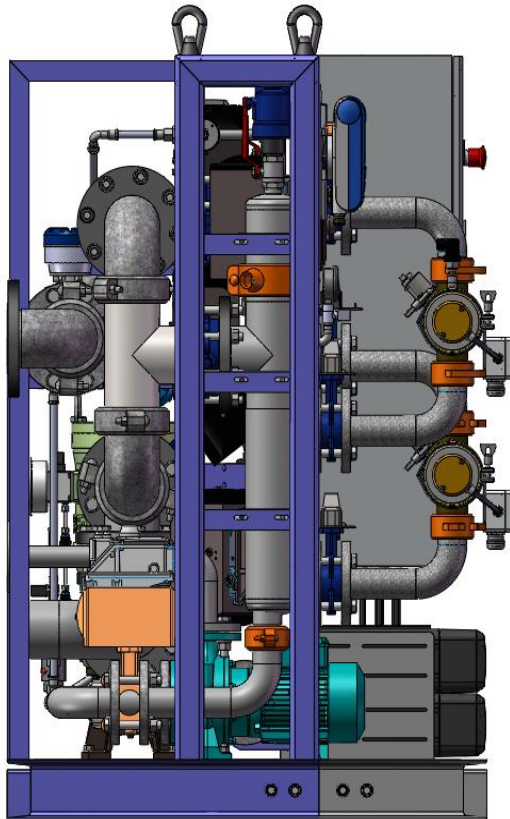
**Retrofit installation**  
**SEISMIC vessels & Cable layer vessels**  
**BIO SEA 90 m<sup>3</sup>/h**

## THE BIO-SEA SYSTEM – SMALL FLOWRATE RANGE

The entire system could be delivered totally dismantled even the skid frame for an easy integration

Or

The system could be separate in two parts to facilitate its transportation across the ship and facilitate its integration





# THE BIO-SEA SYSTEMS



## THE BIO-SEA SYSTEMS





## THE BIO-SEA SYSTEMS

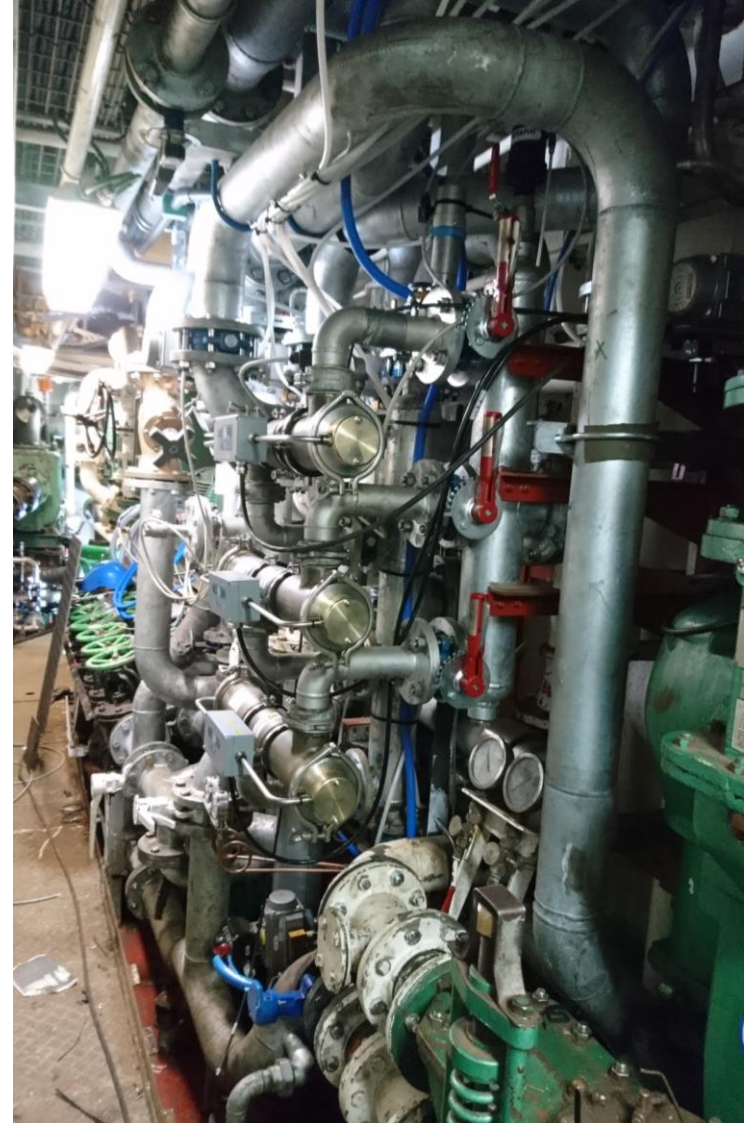


## THE BIO-SEA SYSTEMS



**Retrofit installation  
IFREMER – THALASSA  
BIO SEA 90 m<sup>3</sup>/h**

## THE BIO-SEA SYSTEMS





## THE BIO-SEA SYSTEMS



**Retrofit installation  
MAERSK - STEPANICA  
BIO SEA 2 X 1000 m<sup>3</sup>/h  
3 WEEKS**

## THE BIO-SEA SYSTEMS





## THE BIO-SEA SYSTEMS





## THE BIO-SEA SYSTEMS



## THE BIO-SEA SYSTEMS





## THE BIO-SEA SYSTEMS



***Don't forget that the time is running fast...***

***Production capacities from various serious Markers will be fully booked in a near future***

***Then one advice is to anticipate your orders or at least set up your plan now.***

## SEVERAL CUSTOMERS





## SEVERAL SHIP YARDS CUSTOMERS



# GLOBAL TECHNICAL ASSISTANCE CENTER



Our remote monitoring,

Diagnostics and maintenance  
improve the reliability of vital  
installations,

Avoiding unplanned maintenance,

Minimize service cost and  
eventually reduce your total cost  
of operation.

# BIO SEA world wide Sales & Service Partners

## BIO-SEA Sales and Services Partners





**THANK YOU**

