

The BIO-SEA Solution

1ST STEP: FILTRATION



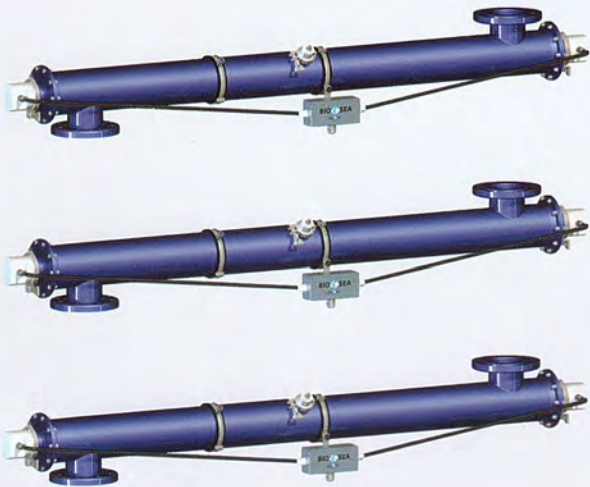
ECONOMICAL
OPTION



ULTRA COMPACT
OPTION

- **40µm filtering element** in stainless steel or duplex, in order to retain suspended solids and zooplankton (microorganism size > 50 µm)
- **Size to scale** depending on the flow rate to treat
- **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
- **Vertical or horizontal** configurations available
- 2 models of filter are available, one very **economic**, and one **very compact**. Housing material and overall shape and position (dimensions, footprint) differ, but test results prove technical performances are identical.

2ND STEP: UV DISINFECTION



- Reactor equipped with a single polychromatic, **medium pressure, high intensity UV lamp**
- A high-quality quartz sleeve protecting 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**, facilitating the installation of UV reactors in parallel and a better **adjustment to the flow** that has to be treated.

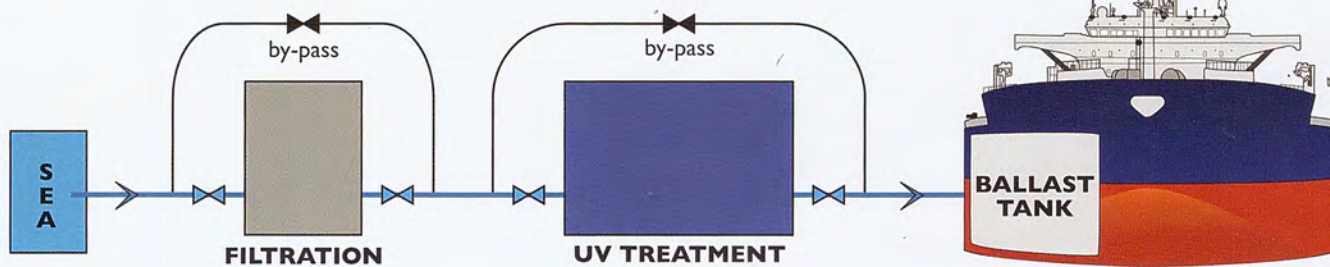
MONITORING AND CONTROL



- **Automated operation and monitoring** through sensors and PLC: UV sensor (w/m²), temperature sensor (°C), flow meter (m³/h), differential pressure switch (bars), end stroke switch (automatic valves)
- Automatic and/or manual operation for ballasting, deballasting, and cleaning
- **Touch screen interface** for easy use and understanding
- **Recording** of operations, alarms, and measured UV intensity (10,000 records of each) covering 24 months
- Operator and Administrator Modes
- Bus communication for remote control and integration to vessel data system and command control.

Simple, Competitive,

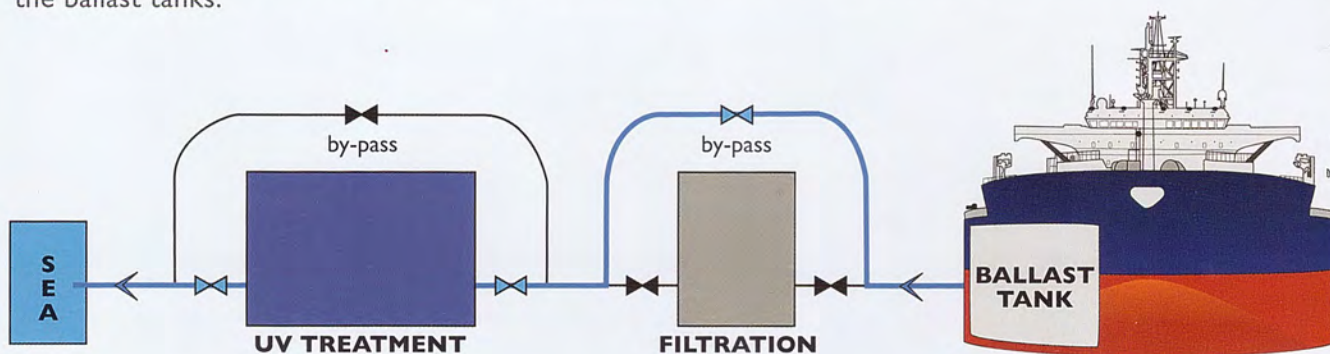
How it works



BALLASTING:

Filtration + UV disinfection

When the pressure gauge indicates clogging of the filter, the self-cleaning cycle is automatically launched. The dedicated backwash pump ensures the discharge of the filtrate, without loss of flow rate while filling the ballast tanks.



DEBALLASTING:

UV disinfection only - filtration is automatically by-passed.

CLEANING:

At the end of operation (either ballasting or deballasting) a total purge of the system is performed, followed by flushing and filling of the filter and UV reactors with fresh water.



Well proven technology, chemical free

Modular: flexible, scalable to any flow rate

Easy to install, operate, and maintain

Automatic operation, easy-to-use interface

Safe: no explosive gases, no induced corrosion, no active substances

Automatic regulation of power consumption depending on water quality

Competitive, quick return on investment

Flexible, Compact

Our Range

The choice between **different sizes and designs of filter** facilitates retrofit as well as new building installations. The **modularity of the UV solution, treating 100 m³/h of brackish sea water per reactor**, meets any pump's flow rate.

Technical Characteristics	
Treatment Capacity	from 100 to 1000 m ³ /h +
Power Supply	380 – 440V; 50-60 Hz; 3-phase
Power Requirement per UV reactor	14 to 22 kW depending on water quality
Environmental Operating Conditions	T°= 0°C - 55°C; H% = 90
Global Head Loss	< 0,5 bar
Min Operating Pressure	1 bar
Max Operating Pressure	10 bars

Dimensions, weights, materials and other data available upon request, depending on the required configuration.

SUCCESSFUL TESTING

Environmental testing (temperature, humidity, vibration, inclination, power variation, and failure, EMC) was performed in accredited laboratories during summer 2011, in accordance with IMO and class societies' requirements.

Land-based tests have been performed with both types of filters at DHI facility in Denmark, during fall 2011.

All tests passed with flying colors in brackish water (17 PSU; 34 NTU) and marine water (36 PSU; 6 NTU).

Shipboard testing is being carried out on 2 container ships in 2012, at 500 and 1000 m³/h:

- CMA CGM, one of the world leaders in shipping, confirmed its choice of "green shipping", and offered to equip one of its vessels to test the BIO-SEA equipment in different Asian harbors
- Searching to learn from synergy, MARFRET company anticipated the performance and reliability of the BIO-SEA system and chose to equip one vessel for tests, to be performed in Europe and North America.

The whole certification process (Type Approval) is monitored by Bureau Veritas.



OUR EXPERIENCE – WHY CHOOSE US?

For more than 12 years, the company designs and offers specific competitive solutions for many applications such as: BWT, wastewater, REUSE, industrial effluents, drinking water treatment, and many more...

BIO-UV managers' and engineers' experience in water treatment has enabled us to be one of the world leaders in UV-C technologies, providing safe and efficient solutions to ensure proper water quality.

For Ballast Water Treatment Application, BIO-UV designed the BIO-SEA, a range of complete systems that combine mechanical filtration and UV treatment (our core business) in accordance with the G8 IMO Guidelines.

100, 200, 300, 400, 500, 600, 700, 800, 900,