



# Headworks BIO™ CLEANSEA®

## INTEGRATED SHIPBOARD WASTEWATER TREATMENT

Headworks BIO CleanSea shipboard wastewater treatment systems deliver effluent quality surpassing the world's most stringent marine discharge standards with the lowest lifecycle treatment costs in the industry.

Integrating premium marine-grade components, CleanSea technology delivers environmental capabilities specifically designed to meet the tough requirements of long-term shipboard operation.

### Headworks BIO™ CLEANSEA®

#### FEATURES

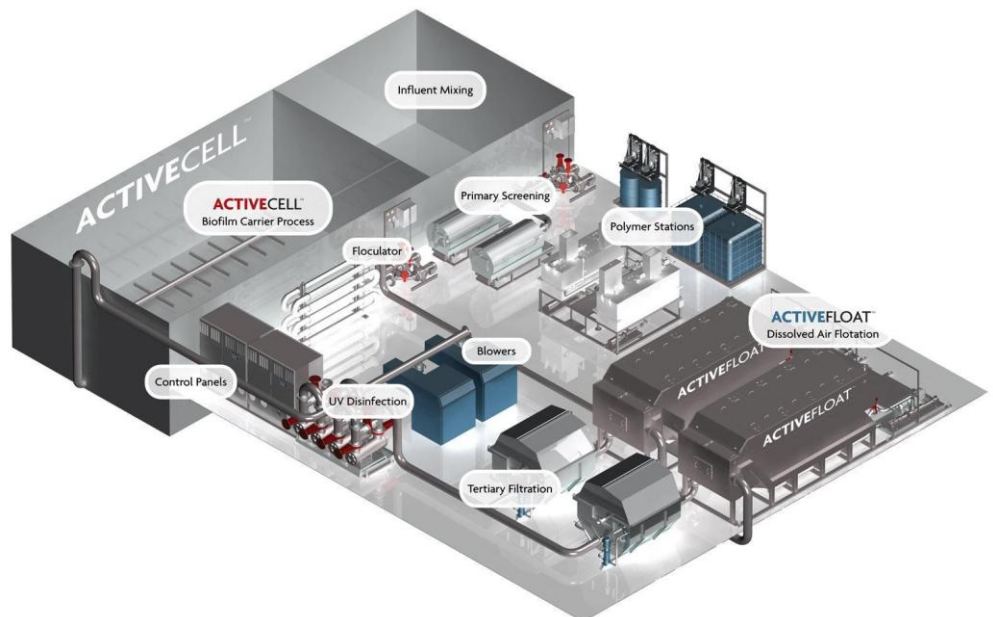
- Advanced black, grey, laundry and galley water treatment processes
- Highest level of customer support in the industry
- Premium marine-grade components
- Compact and space efficient design
- Available with total system redundancy
- Fully automated operation with remote monitoring
- Optional ultra filtration module for technical water re-use.

#### BENEFITS

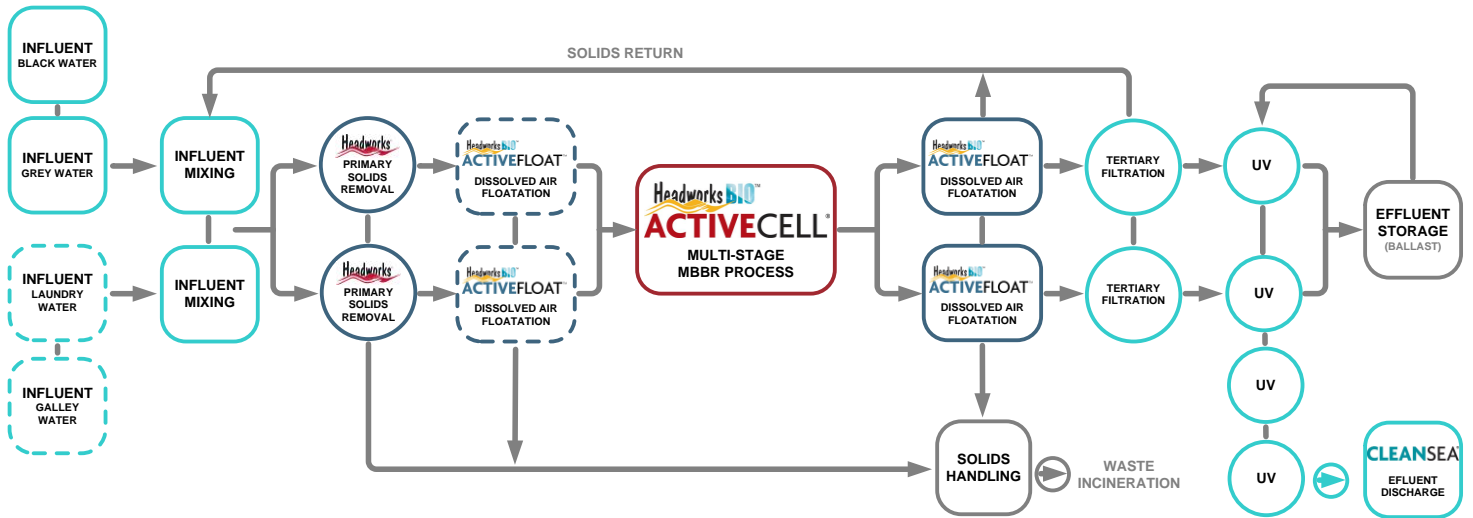
- Lowest lifecycle treatment costs in the industry
- Very low energy and chemical use
- Easy to operate with minimal maintenance
- Process resiliency independent of influent fluctuations
- Reliable, continuous operation with maximum system uptime
- Superior quality, safe effluent for direct discharge

Parameter	Guaranteed Performance	MEPC 159(55) Limit	ADEC 2010 Limit
BOD <sub>5</sub> (mg/l)	< 25	< 25	< 30
TSS (mg/l)	< 35	< 35	< 150
Fecals (CFU/100 ml)	< 14	< 100	< 14
Free Chlorine (mg/l)	< 0.01	< 0.5	< 0.01
pH	6.5 – 8.5	6 - 8.5	6.5 - 8.5
Ammonia (NH <sub>3</sub> -N) (mg/L)	< 28	N/A	< 28
Copper (µg/l)	< 87	N/A	< 87
Zinc (µg/l)	< 360	N/A	< 360
Nickel (µg/l)	< 43	N/A	< 43

CleanSea is designed to efficiently treat any blend of marine wastewater streams including grey water streams from accommodation, galley, decanter reject water, and laundry sources as well as black water.



## TYPICAL PROCESS FLOW DIAGRAM



Headworks BIO CLEANSEA® Integrated Process	
<b>Influent Mixing</b>	Controlled filling from collection to aerated mixing balances pH and ensures consistent influent characteristics; this optimizes CleanSea performance and reduces costs and consumables.
<b>Primary Solids Removal</b>	Primary solids are removed from the influent streams utilizing a fine wedgewire screen; solids are discharged to solids handling processes at a dry weight concentration of ~10%.
<b>ACTIVEFLOAT™ DAF</b>	In systems where high load streams such as galley water and food waste reject water is processed, a pre-DAF is added prior to the bioreactors to provide additional pre-treatment.
<b>ACTIVECELL™</b>	The ActiveCell process employs self-regulating biofilm carrier technology; the ActiveCell system operates in a multi-stage configuration with three reactors for BOD removal and nitrification.
<b>ACTIVEFLOAT™ DAF</b>	Suspended particulates are removed following the ActiveCell biofilm carrier process via ActiveFloat dissolved air flotation (DAF) technology, optimized for shipboard operation
<b>Tertiary Filtration</b>	Low maintenance, self-cleaning filters achieve total suspended solids removal < 25 mg/L
<b>UV Disinfection</b>	High intensity ultra-violet lamps achieve disinfection providing extended coliform destruction; the multi-stage UV array maximizes final treatment performance without chemical use.



**Headworks Bio Canada**

26 Bastion Square  
 Victoria, BC V8W 1H5  
 Canada  
 250.381.8850  
 hw@heaworksusa.com