



Navalis Advanced Oxidation Wastewater Purification Systems

COMBINED
BLACKWATER & GRAYWATER

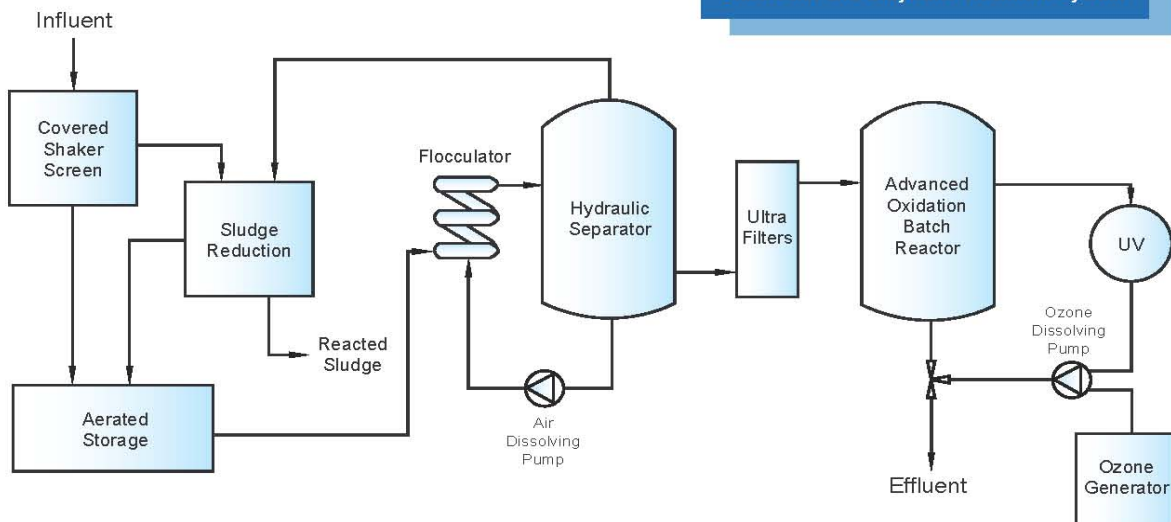
Navalis designed, built, successfully tested, and perfected a family of graywater and blackwater treatment systems employing advanced oxidation with ozone coupled with ultrafiltration. The patented **Navalis Orion® System** is compact in size, simple in design, inexpensive to operate, skid mounted, built for long term reliable operation in the marine environment, hatchable, and can be bolted into place.

- Comply with MEPC.159 (55) Today!
- Real time effluent quality monitoring
- Small footprint, modular hatchable components
- Produces exceptional effluent minutes after startup
- Requires virtually no chemical additions (no chlorine)
- Small vessels, up to 350 people
- No biological sludge production
- Solids reduction through oxidation
- No operator intervention - Simple to operate
- Very low operating and maintenance costs



The Navalis Orion® System built for the United States Navy

This diagram traces the path of the input/output through the Navalis Orion® Sequenced Batch Blackwater and Graywater Treatment System*



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Navalis Orion® Advanced Oxidation Wastewater Treatment System

- US Coast Guard / IMO Type Approved
- Greatly exceeds IMO Annex IV Requirements
- EC Wheelmark - Pending
- Exceed Alaska Requirements (33CFR159 Subpart E)
- Constructed of the most durable components
- Produces highest quality effluent - continuously
- Compliant/Dischargeable effluent minutes after startup



Influent & Effluent from the Navalis Orion® Advanced Oxidation Wastewater Treatment System

Point	BOD ₅ (mg/l)	COD (mg/l)	TSS (mg/l)	Turbidity (NTU)	Coliform (CFU/100 ml)	pH
Test Influent	500	1,100	1,500	>1,000	>36,600	7.2
Orion Effluent	<5	20	BD	<2	BD	7.2
Regulatory Limits						
USCG 33CFR159	N/A	N/A	150	N/A	200	N/A
Alaska Cruise Ship	30	N/A	30	N/A	20	6-9
IMO MEPC.2(IV)	50	N/A	100	N/A	250	N/A
IMO MEPC.159(65)	25	125	35	N/A	100	6-8.5

This chart provides nominal constituent strength values as tested from the Navalis Orion® Sequenced Batch Blackwater & Graywater Treatment System, with comparison to the Alaska Standard. Ask your Navalis representative for current values and details.

BD = Below Detect



O&S* (Operating & Support) = Net Present Value (estimated using 20-year Service Life at 5% Discount Rate) of all prescribed maintenance, parts, component replacement and consumables.

Physical Characteristics				
SYSTEM	MODEL 2.5	MODEL 5*	MODEL 10*	MODEL 15*
Serves (people)	50	100	200	300-350
Capacity: m ³ /day (gpd)	14 (3,700)	28 (7,400)	55 (14,400)	84 (22,200)
Footprint: m ² (ft ²)	6.5 (70)	10.1 (108.7)	11.2 (120)	18.5 (199)
Dry Weight: kg (lbs)	2,800 (6,180)	3,730 (8,210)	4,450 (9,810)	5,721 (12,600)
Wet Weight: kg (lbs)	6,800(14,990)	8,860(19,500)	10,660(23,500)	12,760(28,100)
Max Height: m (ft)	2.5 (8.2)	2.5 (8.2)	2.5 (8.2)	2.5 (8.2)
Service and Consumable Requirements				
Electrical Service: amps, 480v, 3-phase	30	40	40	60
Operating Power: kW	19.2	24.5	24.8	28.1
Average Monthly Power: kW-hr	11,660	14,820	15,700	16,878
Service Air: m ³ /hr, 2.0 bar, oil free	10.2	10.2	10.2	20.4
Inorganic Coagulant: l/month	3	4	8	12
Membrane Wash Chemicals	24	38	38	38
Technical Water	Available for Cleaning			
Internet Connectivity	Dedicated IP Address			
Annual O&S* Cost				
	~\$8,250	~\$10,134	~\$10,150	~\$10,284

* US Coast Guard and IMO MARPOL Annex IV certified

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