

# Navalis Optimum Wastewater Treatment Systems BLACK WATER

## The Navalis Design and Philosophy

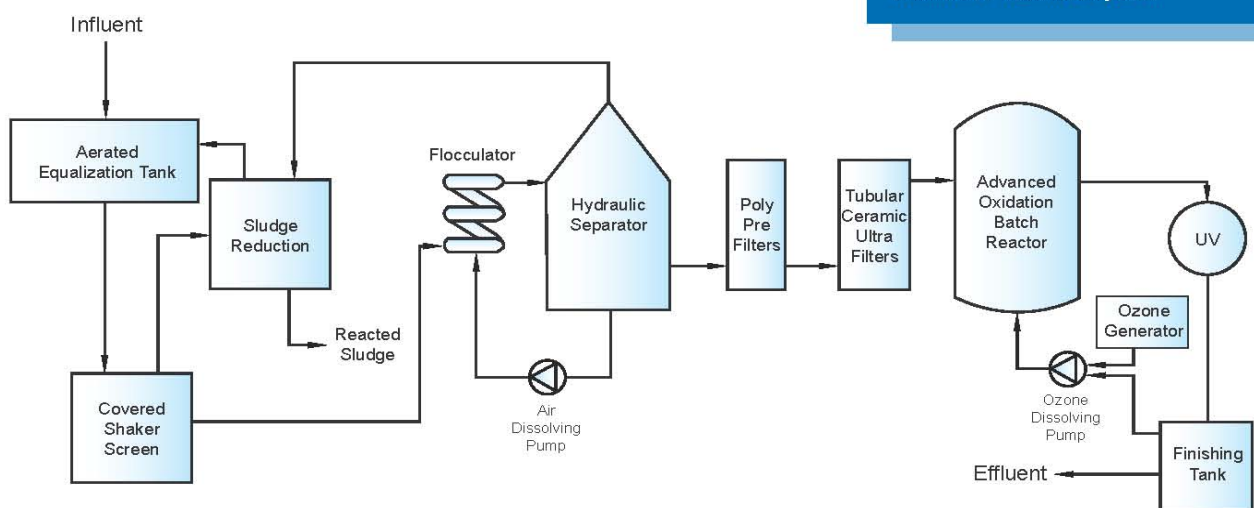
Navalis has studied the treatment of wastewater onboard ships and concluded that although biological based systems produce good quality effluent, they are complicated to operate, have a large footprint in terms of tankage and deck space, and are susceptible to periodic chemical upsets. They can be expensive to operate due to costs of chemicals, require provisioning of these chemicals, have long start-up times (order days) and produce large amounts of sludge. In contrast to the disadvantages of most biological based systems, the patent pending **Navalis Poseidon®** optimum wastewater treatment systems:

- Are US Coast Guard / IMO Type Approved
- Comply with MEPC.159 (55) Today!
- Are small in footprint
- Produce dischargeable effluent minutes after startup
- Require virtually no chemical additions
- Are simple to operate
- Minimal solids production, no biological sludge produced
- Are constructed of the most durable components
- Produce a high quality effluent exceeding most stringent



The Navalis Poseidon® Blackwater System (front view)

This diagram traces the path of the input/output through the Navalis Poseidon® Blackwater Treatment System\*



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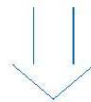


# Navalis Poseidon® Blackwater Systems Will Meet or Exceed Industry Standards

The Navalis Poseidon® Treatment Systems exceed 33 Code of Federal Regulations Section 159, Subpart E requirements for discharging wastewater into the waters of Alaska. Navalis has received US Coast Guard and IMO MARPOL Annex IV certification for the Poseidon family of systems and is pursuing US Coast Guard, IMO MARPOL Annex IV and EC Wheelmark certification for its other product lines.



- Exceeds IMO Annex IV Requirements
- Exceeds Alaska Requirements (33CFR159 Subpart E)
- Bring existing MSDs into Compliance Affordably
- Compliant/Dischargeable Effluent Minutes after Startup
- No Biological Sludge Produced
- Modular, Hatchable and Expandable



This chart provides nominal constituent strength values as tested from the Navalis Poseidon® Blackwater System, with comparison to the Alaska Standard (\*\* indicates no standard established). Ask your Navalis representative for current values and details.

Point	BOD <sub>5</sub> (mg/l)	COD (mg/l)	TSS (mg/l)	Turbidity (NTU)	Coliform (CFU/100 ml)	pH
Influent	2,750	5,000	2,500	1,000	>1,600	7.2
Effluent	<5	20	BD	<1	BD	7.2
Alaska Cruise Ship	30	*	30	*	20	6-9

BD = Below Detect



Capacity	People	Footprint	Dry Weight	Wet Weight	Power (kW)	Annual O&S <sup>t</sup> (US \$)
10 gpm* (55 m <sup>3</sup> /day)	150-300	76 ft <sup>2</sup> (7.1 m <sup>2</sup> )	8,870 lbs (4,023 kg)	17,130 lbs (7,770 kg)	17.1	~ \$7,400
20 gpm* (110 m <sup>3</sup> /day)	1,000	145 ft <sup>2</sup> (13.4 m <sup>2</sup> )	15,500 lbs (7,030 kg)	38,000 lbs (17,240 kg)	27.2	~ \$10,700
80 gpm* (436 m <sup>3</sup> /day)	4,000	349 ft <sup>2</sup> (32.4 m <sup>2</sup> )	34,950 lbs (15,868 kg)	85,480 lbs (38,810 kg)	78.5	~ \$36,400
120 gpm* (656 m <sup>3</sup> /day)	6,000	403 ft <sup>2</sup> (37.4 m <sup>2</sup> )	45,958 lbs (20,866 kg)	116,802 lbs (53,032 kg)	91.8	~ \$38,300

\* US Coast Guard and IMO MARPOL Annex IV certified

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

Combined = 100% Blackwater and 100% Graywater

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