

BENRAD MARINE

176195
Docket Management Facility
(USCG-2001-10486) ▾
US Department of Transportation – room PL-401
400 Seventh Street SW.
WASHINGTON DC 20590-0001
USA

Stockholm May 24, 2001

**Subject: Advanced Notice of Proposed Rulemaking – 38
Standards for Living Organisms in Ship's Ballast Water
discharged in US waters**

Dear Sirs,

We kindly refer to your document with reference code 33 CFR Part 151, requesting for comments with regards to future Ballast Water Standards.

Please find attached a document outlining our, BenRad Marine Technology's, views with regards to the setting of future standards as well as giving an insight to the technology that we represent.

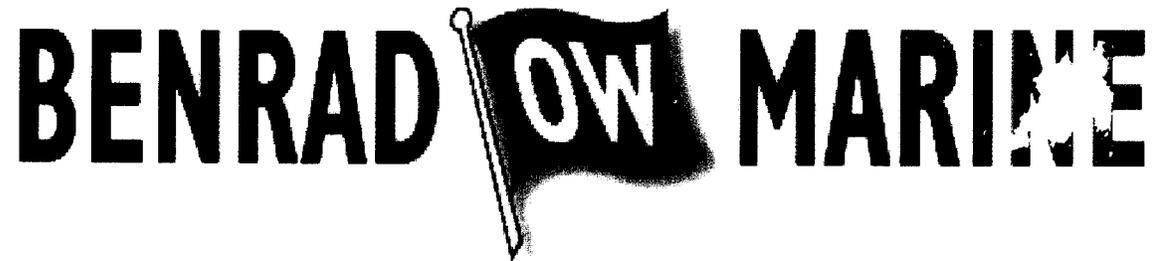
Would there be any questions or comments to the material submitted, please feel free to let us know.

Yours faithfully,
BenRad Marine Technology AB



Patrick Dahl
President

02 JUN - 6 PM 2001
USCG-2001-10486



The BenRad Water Purifying Technology

- Comments on future BWT standards -

Stockholm May, 2001

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Table of Contents

Introduction	Page 3
The Technology	Page 4-6
Ballast Water Treatment Solution	Page 7-10
Setting a standard	Page 11-12

Enclosure: 1. Product Line (current) 3 pages

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Introduction

BenRad Marine Technology is supplying Water Purifying Solutions to the marine- and offshore industry. The purifying systems are based on a patented technique held by BenRad AB. Today, the BenRad products are gaining increased recognition for its high performance and effectiveness in the field of Water Purification. Our equipment is based on an Advanced Oxidation Technology, which provides for a highly efficient and environmentally friendly treatment of onboard water.

BenRad Marine Technology AB was founded in 2001 and is a sister company to Wallenius Lines, one of the world's leading RollOn-RollOff ocean carrier with a very strong ambition towards environmentally friendly shipping. Wallenius Lines was one of the first commercial ocean shipping lines in the world to obtain ISO 14001 certification.

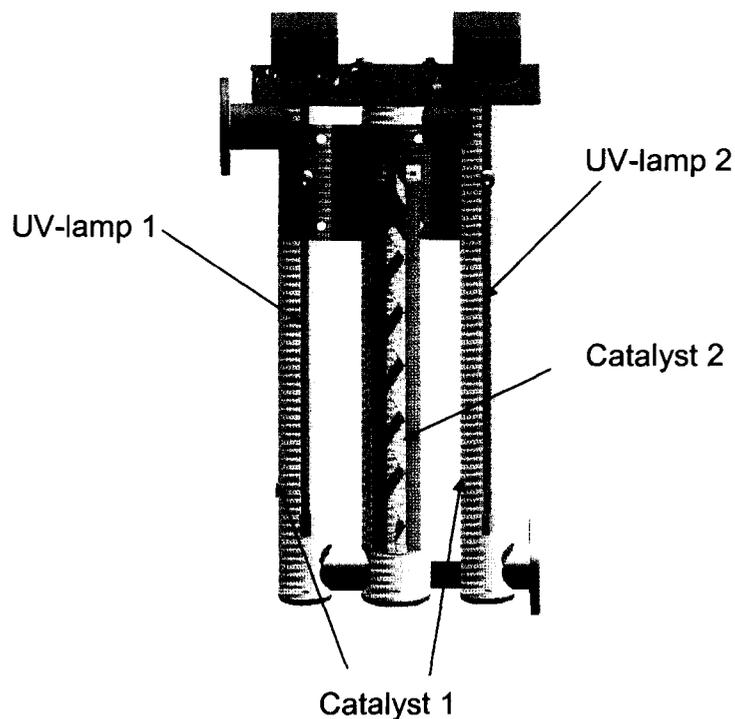
In this document we will provide an insight to the basics of the technology as well as the work towards a Ballast Water Treatment System. Further we will elaborate on the construction of future treatment standards.

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The Technology

BenRad Marine Technology's water purifier destructs – eliminates microorganisms and reduces other organic materials in water.

The Advanced Oxidation Technology (AOT) consists of a combination of ozone (O_3), two UV systems with different wavelength spectra and two different catalysts. Thus Ozonolytic / Photolytic / Photocatalytic Redox Processes are operating simultaneously within a reactor.

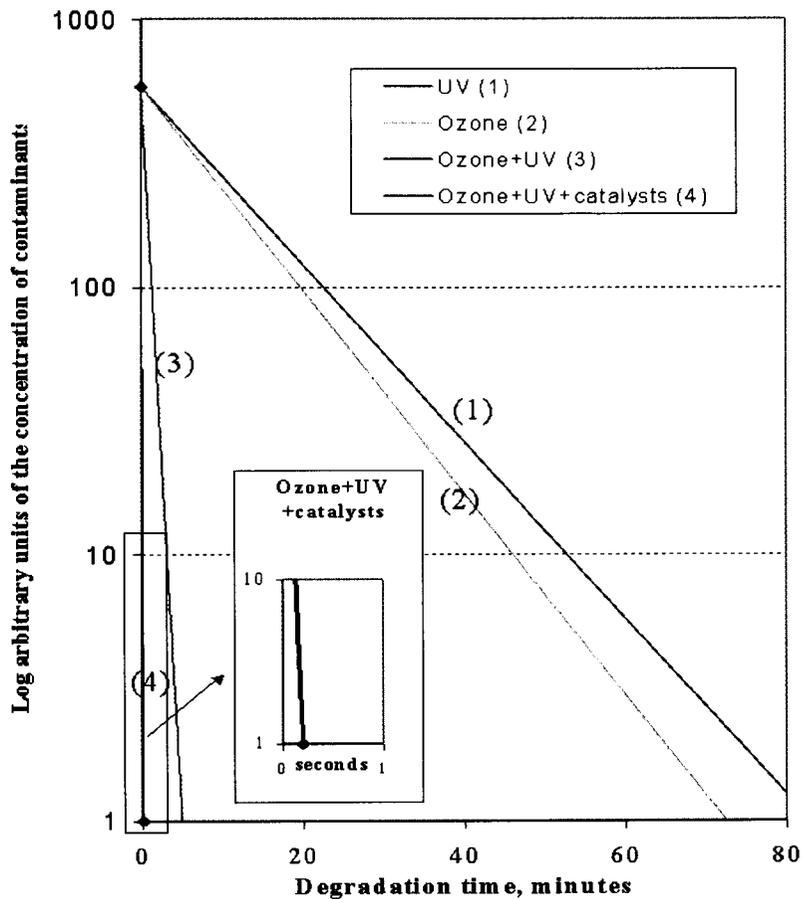


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The efficiency of the technology

The unique combination is designed to generate large amounts of radicals, mainly hydroxyl radicals, within the reactor. These radicals destruct / eliminate the microorganisms and make our process hundred or even thousand times more effective than conventional technologies.

Synergism in degradation obtained by combining two or more AOTs



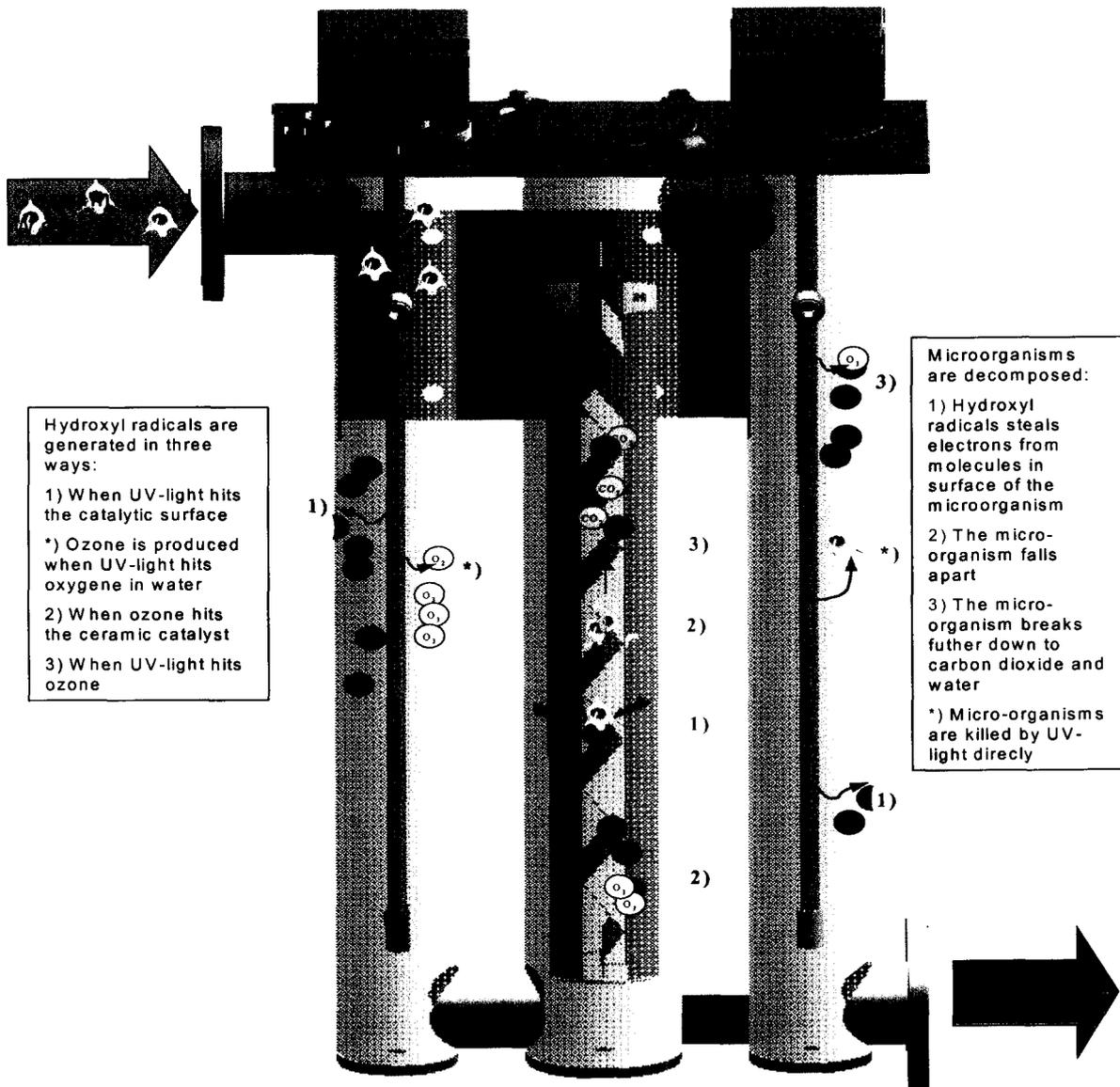
The combination line (4) shows our Advanced Oxidation Technology (AOT).

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The decontamination process

Within the water purifying unit large amounts of $\cdot\text{OH}$ (hydroxyl radicals) are generated. The $\cdot\text{OH}$ are extremely aggressive and react instantaneously with microorganisms and other organic contaminants. They exist only a few nanoseconds. The $\cdot\text{OH}$ steal electrons from the contaminant molecules and a chain reaction is started that does not stop until everything is decomposed to elements, water and carbon dioxide. See the picture below.

The Advanced Oxidation Technology



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Ballast Water Treatment

BenRad Marine Technology is setting out as its main mission to provide for an economically viable and efficient solution to treat ship's ballast water. In doing so there are four ground parameters guiding this work:

- treatment efficiency
- flexible and compact design that considers the onboard space conditions
- user friendliness – a minimized burden to the onboard crew in operating the system
- price competitiveness (acquisition & operation)

Despite the fact that guiding standards for treatment of Ballast Water are yet to be set, the development work at BenRad Marine Technology is well advanced and the goal is set to met the most stringent of demands. A prototype capable of treating approximately 400 cbm per hour will be ready within 3Q 2002 and is expected for serial production in 2003.

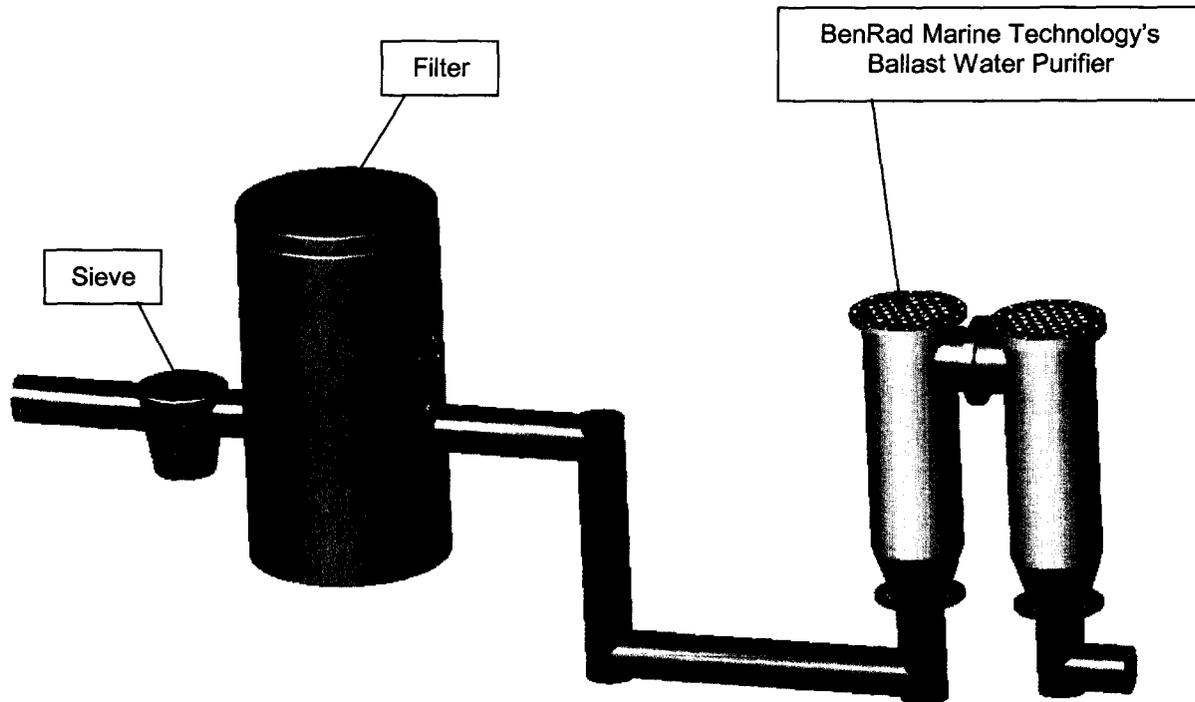
On the basis of the successful results obtained in tests and other treatment installations we are convinced that the technology is extremely potent in eliminating organisms and bacteria also in ballast water.

System Design

The Ballast Water Treatment solution is designed to treat the water on-line during ballasting and de-ballasting. The BenRad Water Purifier should be installed together with a pre-treatment solution (filter or similar) upstream the water purifier, eliminating all larger particles. Initial tests have shown good results with a number of filter equipment and these evaluations are now continuing to find the most efficient combination/s.

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Principal Design Drawing



Initiatives

BenRad Marine Technology is, in its own name and also through its sister company Wallenius Lines, very active in many of the forums that is currently working actively towards a solution for Ballast Water Treatment.

Most significantly our system will be one of those tested and evaluated within the MARTOB project that is funded by the EU and run by the University of Newcastle. Tests will be initiated in June -02.

We also take part in the workshops held by ICES (International Council for the Exploration of the Sea) on the subject and are in close discussions with Gauss (Gesellschaft fuer Angewandten Umweltschutz und Sicherheit im Seeverkehr) in Germany (Bremen) with regards to their planned evaluation programme for Ballast Water Treatment Systems.

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Cost Calculations (preliminary)

Given the competitive environment of global trading and the shipping industry in particular we have set out to supply a system that provides ship owners with a cost efficient solution to treatment of Ballast Water.

While there are details still to be confirmed with regards to the final system configuration, certain assumptions has been made in the calculations below.

Clarifications:

- below is based on the filter system (upstream the BenRad process) removes particles down to 200 microns.
- straight-line depreciation period of the entire system (pre-filtration and BenRad) of 5 years.

Input data – Example 1:

Vessel type:	Dry-bulk
Vessel size:	GT 79,000 ts / DWT 150,000 ts
Ballast tank size:	Light 54,850 ts / Heavy 93,905 ts
Pump capacity:	5,000 cbm/hr (2 x 2,500 cbm/hr)
Annual ballasting:	751 200 tonnes (8 voyages)

Total System cost: USD 1,499,440

Annual Running cost: USD 1,500

Annual Replacement cost: USD 5,500

Cost per cbm of ballasting: USD 0.41

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Input data – Example 2:

Vessel type:	Chemical tanker
Vessel size:	GT 29,211 / DWT 44,419
Ballast tank size:	22,592 ts
Pump capacity:	2,000 cbm/hr (2 x 1,000 cbm/hr)
Annual ballasting:	123,000
Total System cost:	USD 616,040
Annual Running cost:	USD 1,000
Annual Replacement cost:	USD 2,000
Cost per cbm of ballasting:	USD 1.03

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Setting a standard.....

BRMT have well reviewed the documentation submitted with regards to the setting of a future BWT-standard and we will below provide our inputs on minimum levels as well as practical implementation methods.

Form of limit

It is our view that any form of standard is best established in fixed number of organisms per volume of water (number / ml). This to provide for a clear and distinct target that can be easily understood and complied with by all parties involved. These levels are to be set by scientists well familiar with the issue.

When it comes to bacteria we see these as a vital part of a future standard and the minimum level for bathing water as stated in several of the options, Enterococci (35/100ml) and Escherichia coli (126/100ml), as being sound. In addition we consider Heterotrophic bacteria equally important where we recommend a minimum level of 1,000/ml which also that corresponds to set standard for bathing water.

On the same token we would like to add that levels to be set according to above principles should be stringent and represent an elimination rate equivalent of a theoretical value of 99%. This being the treatment level we think should be put on any BWT-equipment and this is equally the level we are confident BenRad Marine Technology fulfils.

Assessment/Measurement

In order to provide for a practical control of BWT-compliance (in lack of reliable on-line measurement methods) and still ensure a smooth ship's operation we would suggest the following routines to be put in place.

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1. BWT equipment needs to hold a type approval from a credible authority where its effectiveness has been confirmed and documented.
2. A Classification Society, or other agreed authority, ensures that the BWT-system in question has been installed on to the vessel in a correct manner.
3. Onboard the vessel a log-book is kept that verifies that concerned BWT-equipment has been in operation when required.

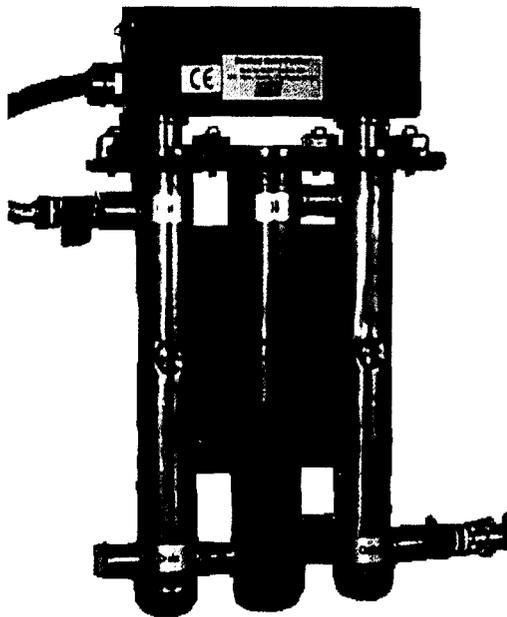
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Enclosure 1 - Product Line (current)

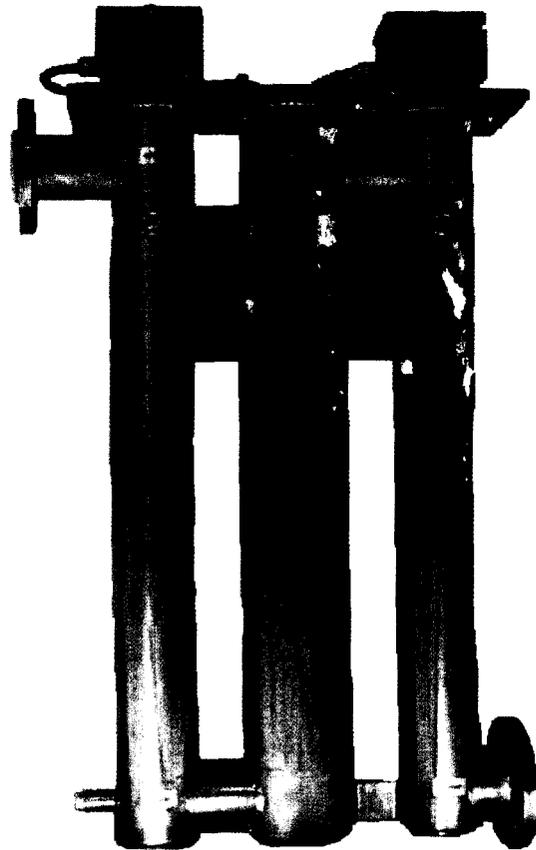
Model M28 and Model M74 for decontamination of onboard water.

The water purifiers are capable of destroying/eliminating microorganisms and reduce organic chemicals and bad smell and taste from drinking or process water. This is done through a patented Advanced Oxidation Technology (AOT) generating radicals within the unit. It is a closed system consisting of a reactor and a control panel. The process does not use any chemicals and leaves no residuals.

All water purifiers are made of titanium and do not have any moving parts. The energy consumption and operation costs are low.



Model M 28



Model M 74

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Specification

BenRad Marine Technology is offering two products with different capacities. For larger water flows more than one unit has to be installed.

Model:	M28	M74
Effect (W)	28	74
Water flow (l/min)	<30	<300
Pressure drop (bar)	<0,1	<0,1
Operating pressure (bar)	<5	<5
Width (m)	0,33	0,58
Depth (m)	0,13	0,22
Height (m)	0,46	1,04
Weight (kg)	6	30,5

Installation, Operation and Maintenance

The installation of BenRad Marine Technology's water purifiers can be performed by a plumber and an electrician. A pump is required upstream the water purifier equipments which is often, depending on the application, already fitted within the base system. To eliminate particles in the water pre-treatment (filtration) needs to be used.

The water purifiers shall be connected to the electricity supply system (240 V / 50-60 Hz). The unit is easily manoeuvred through the control panel.

A water purifier needs limited maintenance. Once or twice a month the UV lamps need to be wiped off with a cloth. The UV lamps are the only components that need to be replaced and they have an operating capacity up to 9,000 hours.

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Application Areas

The BenRad Water Purifiers are extremely potent in treating all kinds of contaminated water and there are numerous applications onboard where the purifiers may eliminate/limit the use of chlorides and enable a higher degree of re-use of the water.

Please find below a list of the various areas where the system may be of great benefit:

- Condensation Water
- Swimming Pools
- Jacuzzis
- Fountains
- Grey/Black water
- Laundries
- Cooling Water