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Pure thinking

Concern. Commitment. Contribution.





PureBallast

The market-leading
ballast water
treatment system



2003

Installation of first PureBallast
prototype on M/V Don Quijote





DET NORSKE VERITAS
TYPE APPROVAL CERTIFICATE

CERTIFICATE NO. P-12397
This Certificate consists of 3 pages

This is to certify that the
Ballast Water Management System
with type designations
PureBallast 250 - 2500

Manufactured by
ALFA LAVAL TUMBA AB
TUMBA, SWEDEN

is found to comply with
IMO Resolution MEPC. 125(53), IMO Resolution MEPC. 126(53) and DNV Rules Pt.4
Ch.1, Pt.4 Ch.6 and Pt.4 Ch.9 Sec.5 B1000

Application
This is to certify that the Ballast Water Management System listed below has been
examined and tested in accordance with the requirements of the specifications contained in
the Guidelines and DNV Rules stated above. This certificate is valid only for the Ballast
Water Management System referred to above.

The certificate is issued on behalf of Norwegian Administration

Place and date
Havvik, 2008-06-27
for DET NORSKE VERITAS AS

This Certificate is valid until
2013-06-27


Kåre Klokke
Head of Section

Local Office
DNV Stockholm



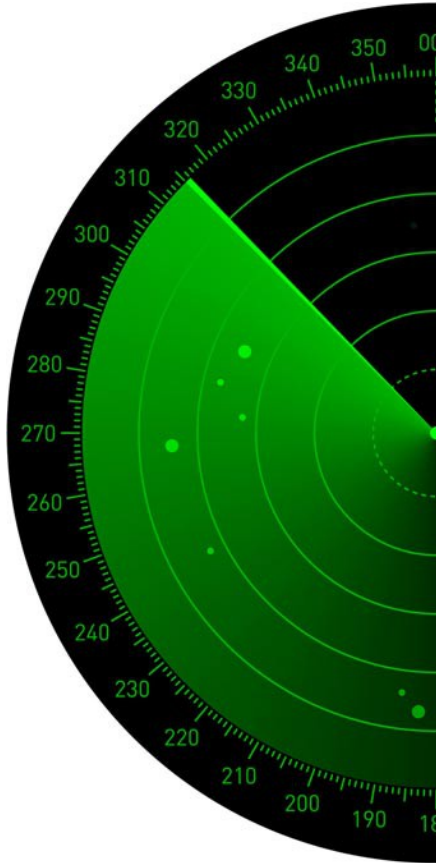

Erik Nyquist
Surveyor

Notice: This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

June 2008
IMO Type
Approval

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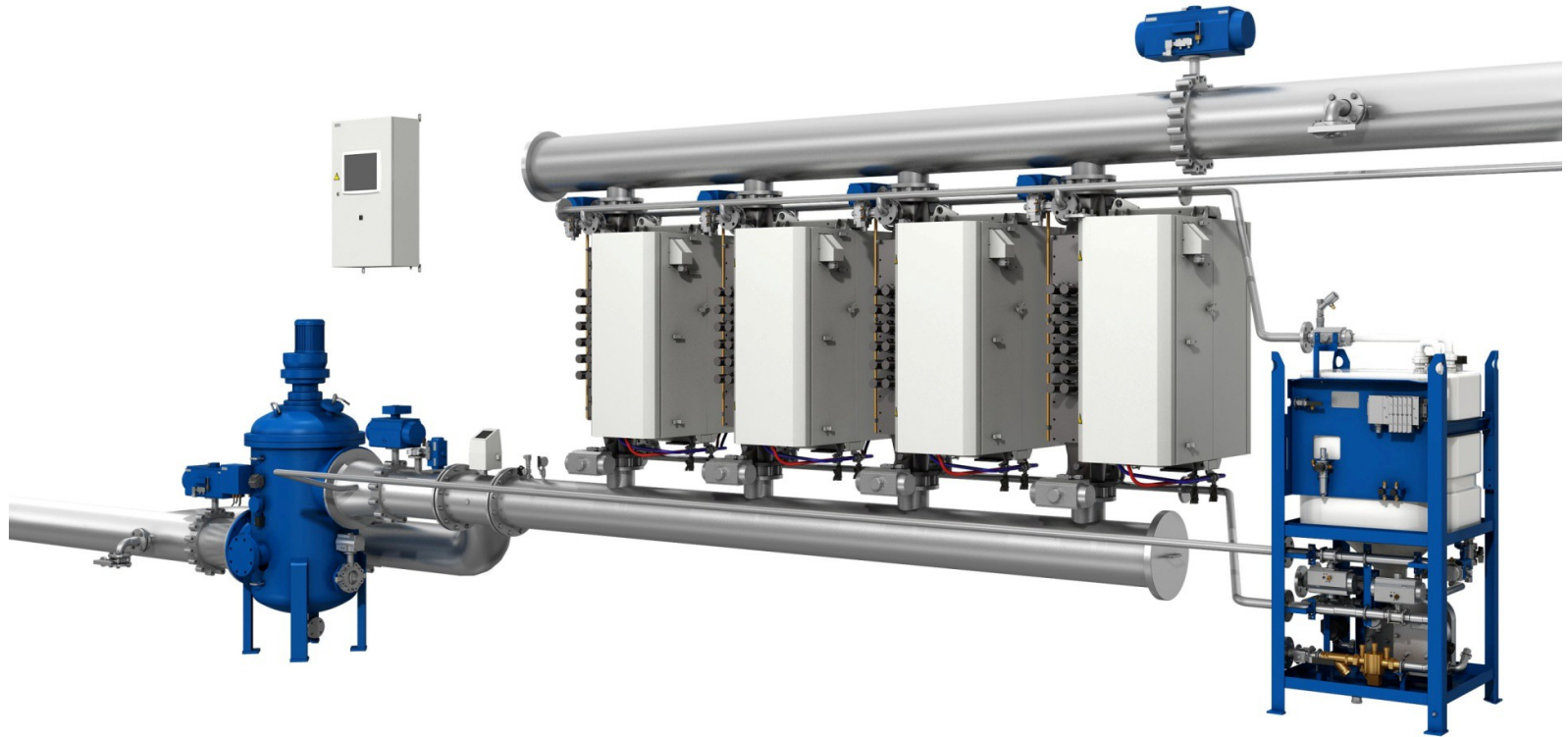
References



- Alfa Laval is a major supplier to the marine industry for more than 80 years
- More than 200 systems sold
- About 130 systems delivered
- About 60 systems commissioned
- Sales and service at all major ports all over the world

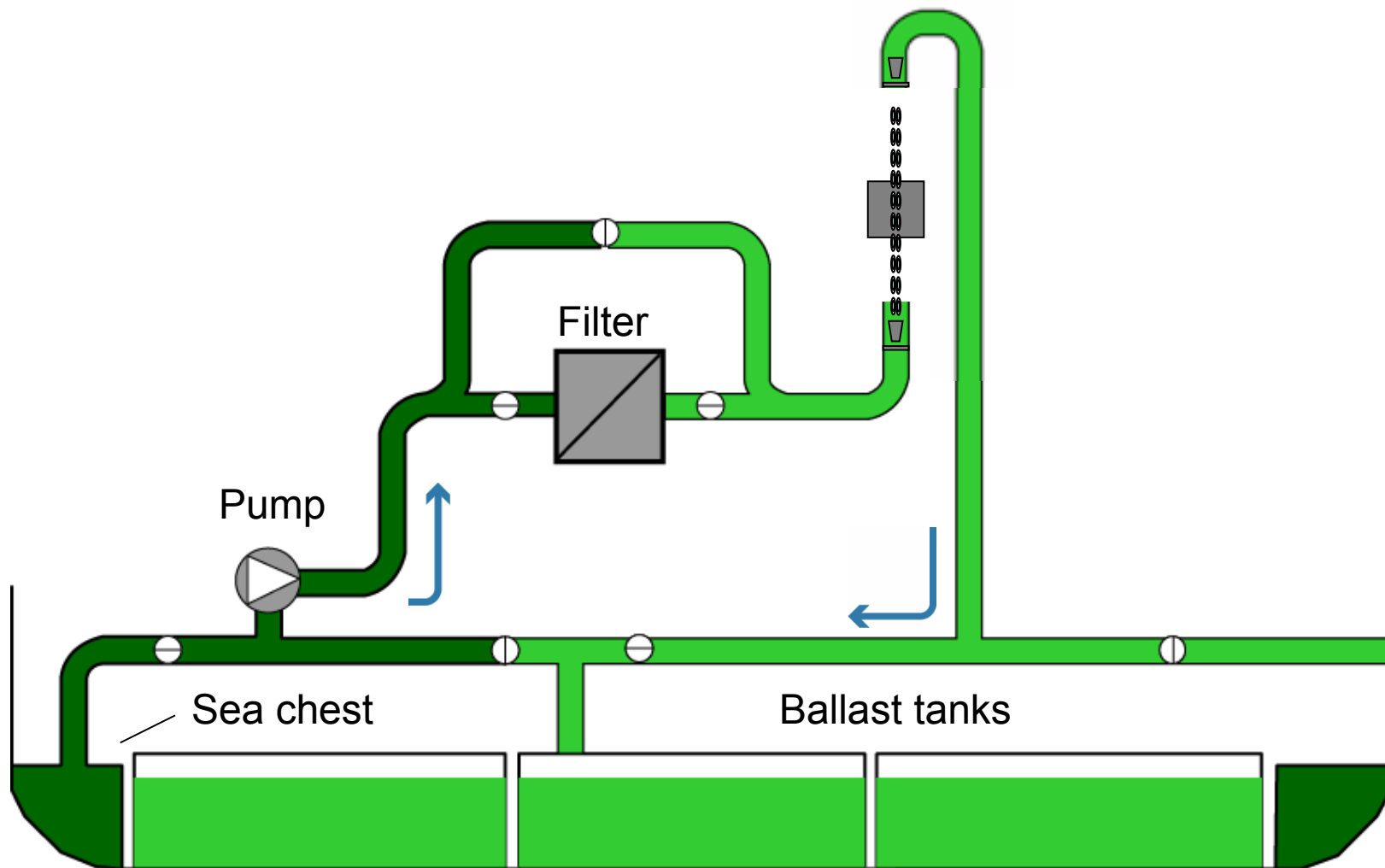
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PureBallast Overview



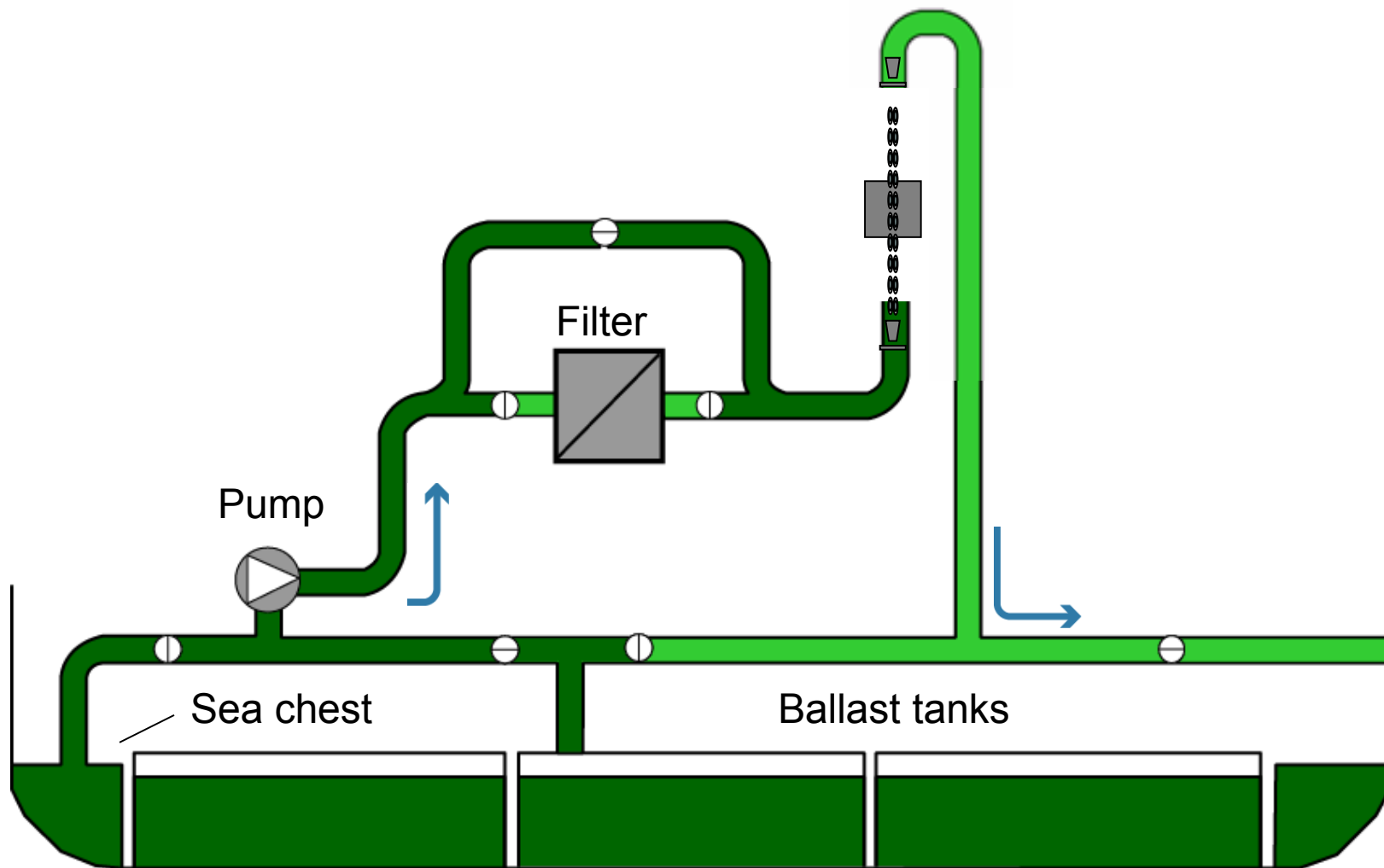
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Working Principle – Ballast



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Working Principle – Deballast



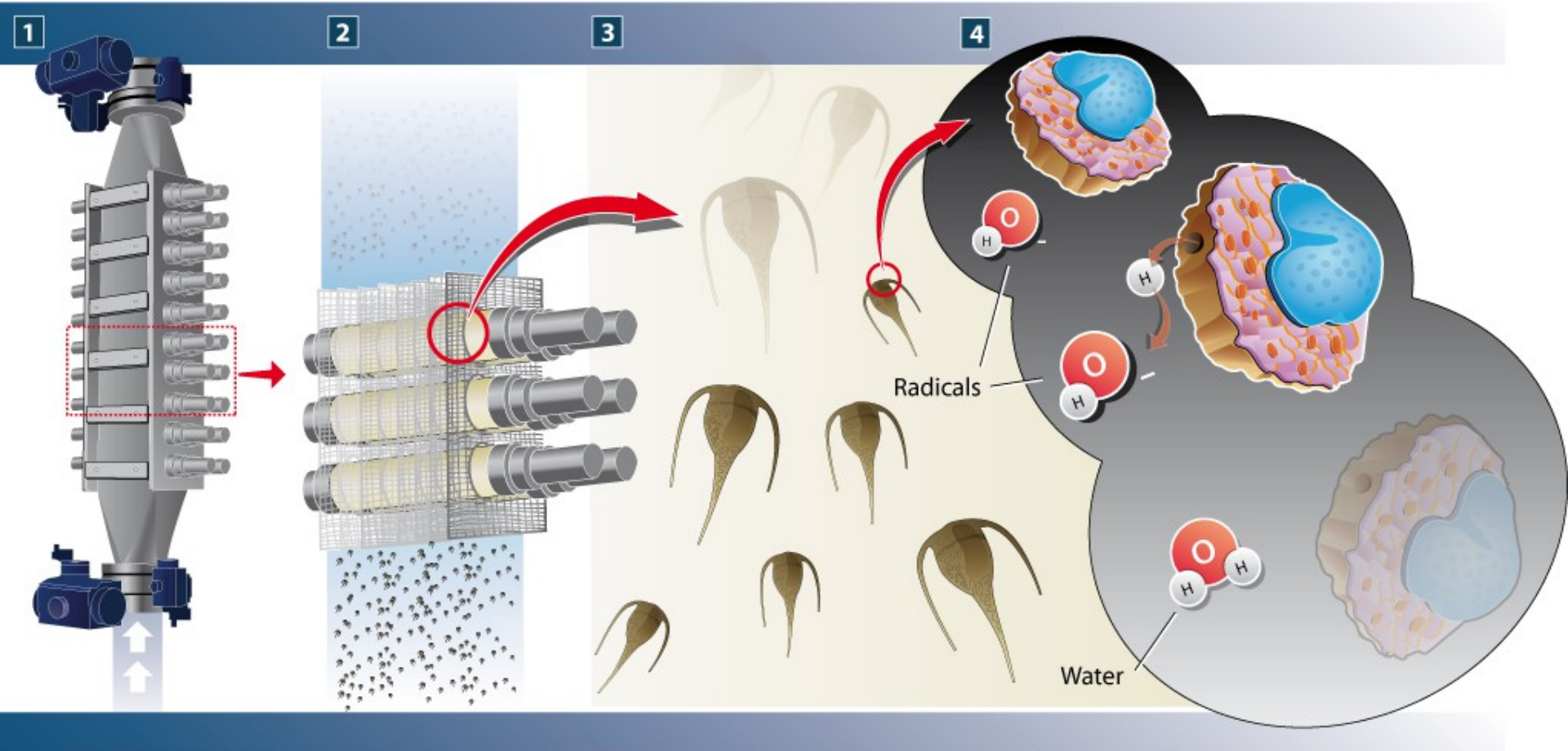
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Advanced Oxidation Technology – AOT

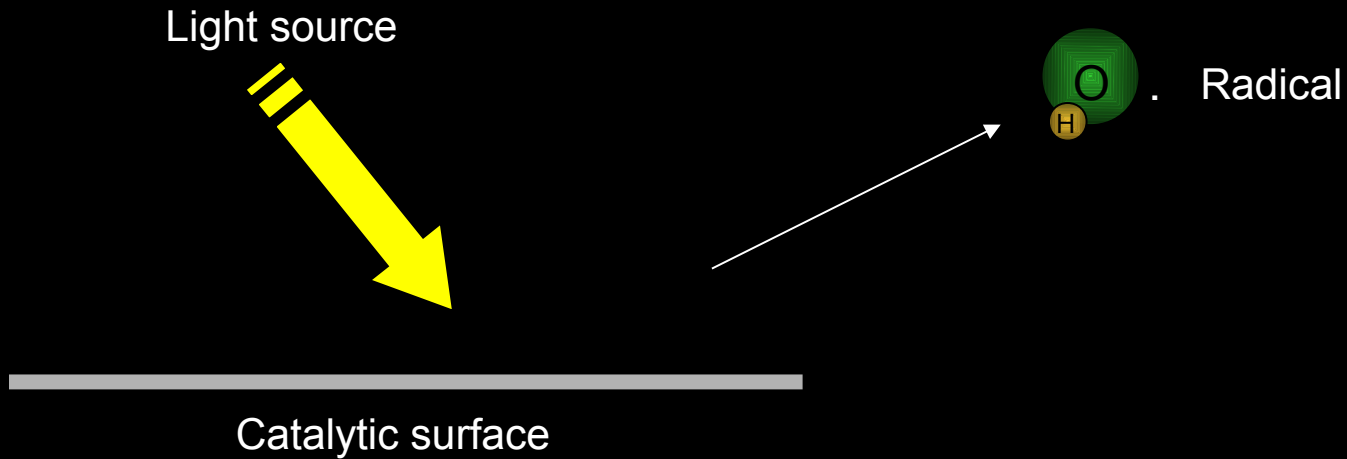


- UV light and catalysts produce radicals that break down microorganisms
- Radicals have a lifetime of microseconds (all reactions take place inside the AOT)
- Creates no toxic residuals (IMO final approval of active substance G9)

AOT - Process



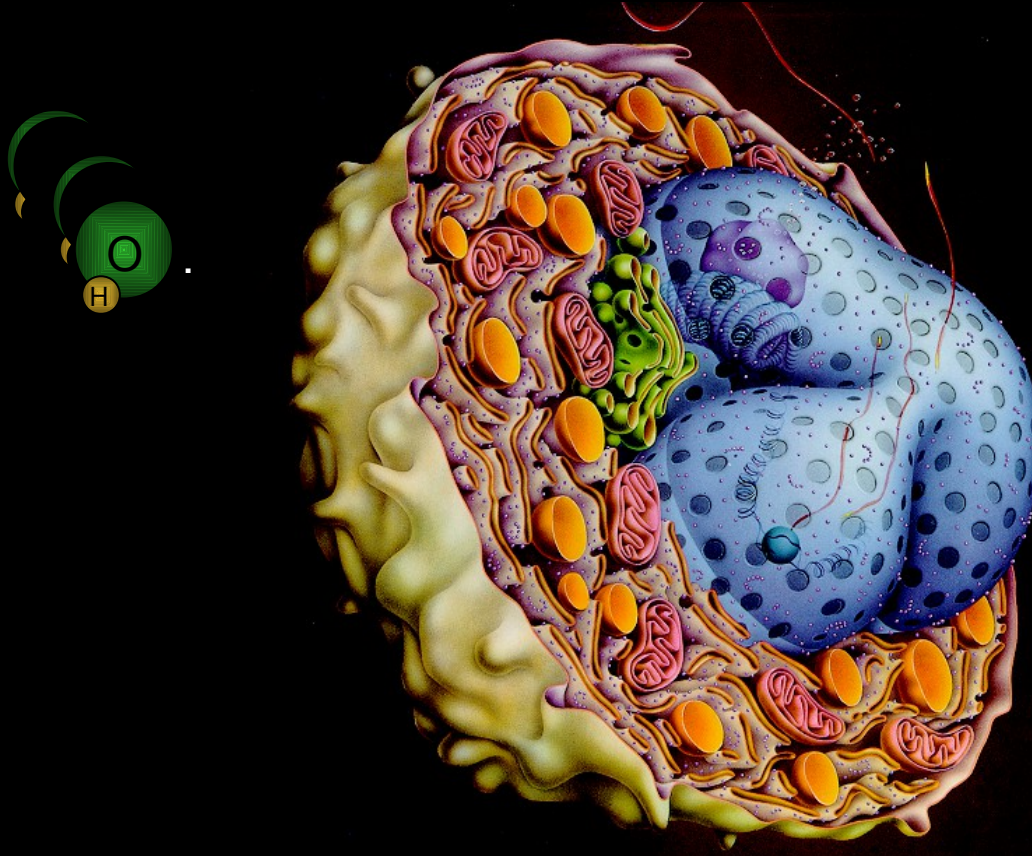
Radical formation



when exposed to light at catalytic surfaces, radicals are created

a radical is a highly unstable molecule and is therefore extremely reactive

Radical effects...



cro organism

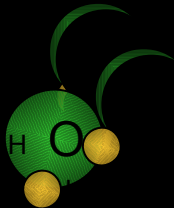
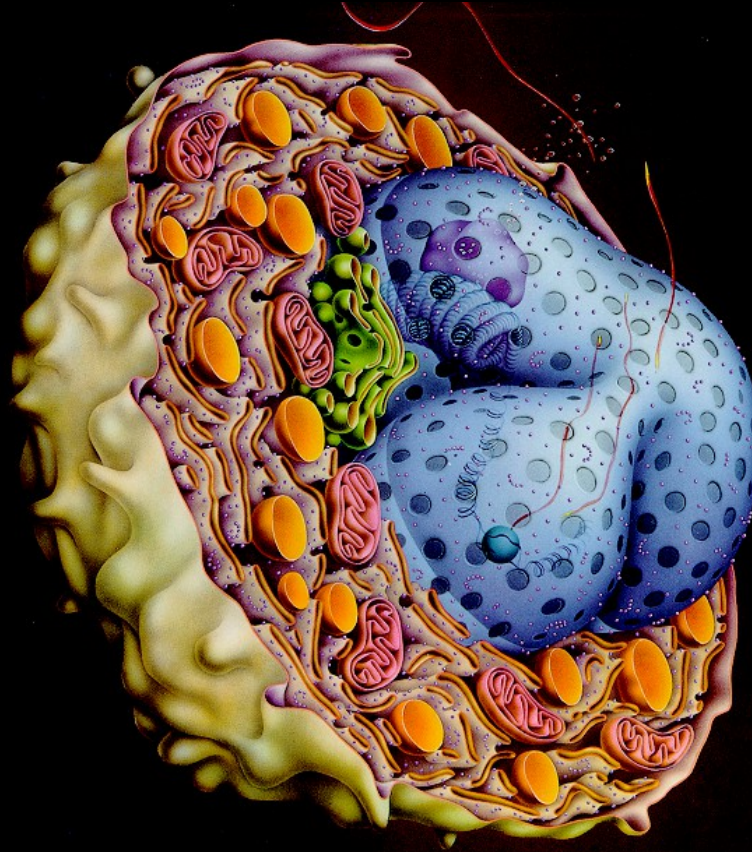
unstable radical generated close to micro-organism...

Radical effects...



...radical steals hydrogen atom...

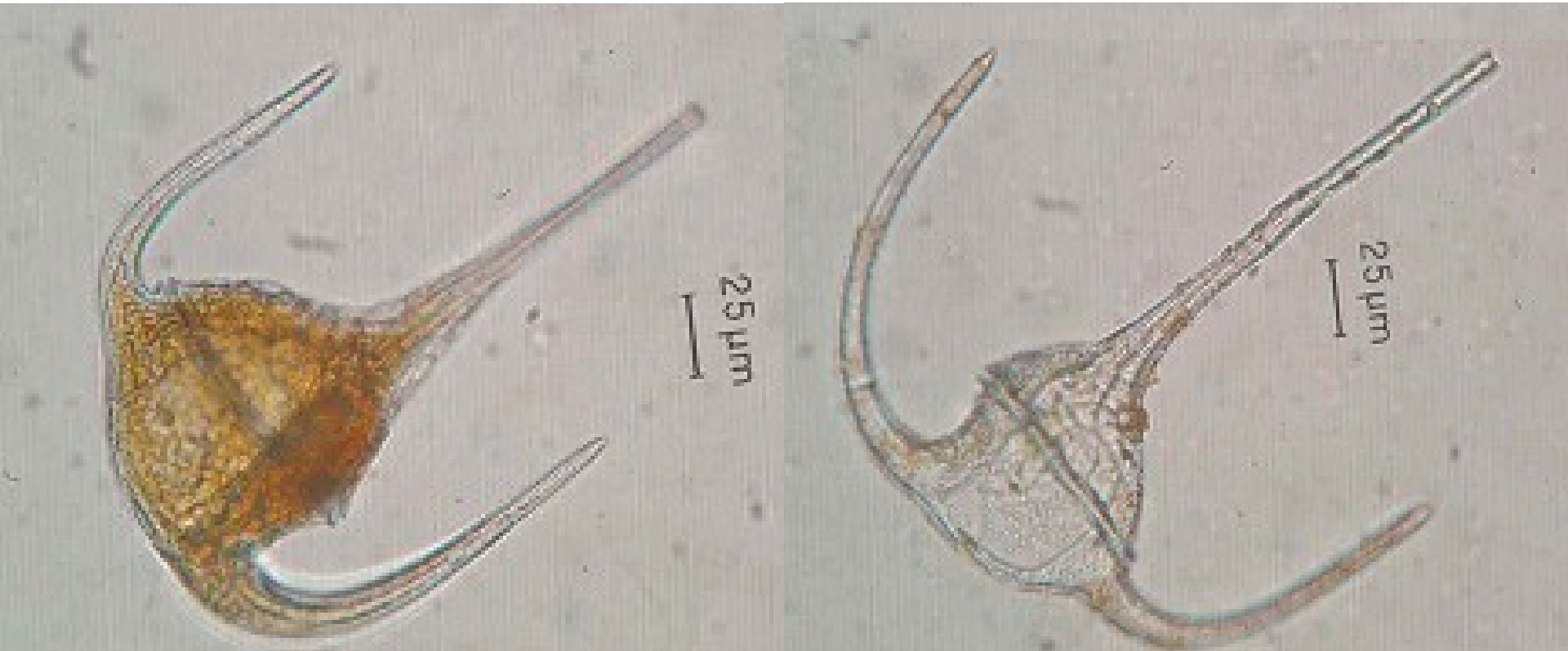
Radical effects...



...which leads to...

lethal physical damages in the vital cell membrane
(without intact cell membrane the cell cannot survive)
and radical is transformed to water

Radical effects...



Before Treatment

After Treatment

IMO Certification



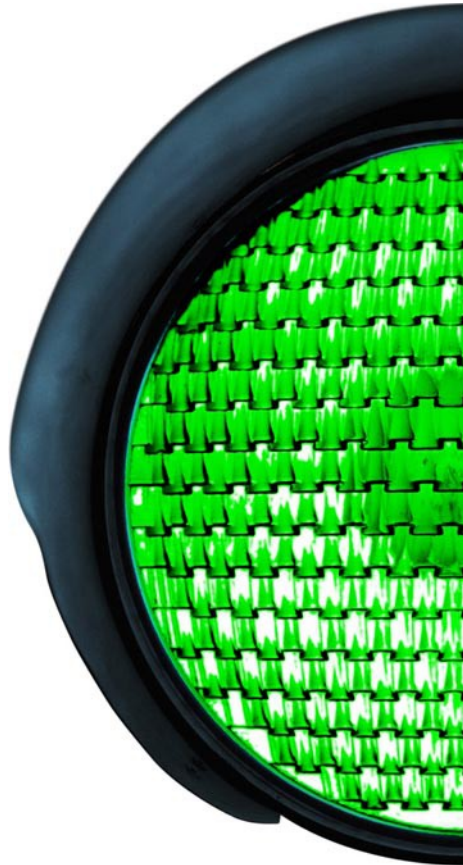
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Biological Performance

IMO Requirements

Organism type	Unit	Test water	Discharge Standard	Efficiency
Organisms > 50 µm	Ind/m ³	> 100.000	< 10	> 99.99 %
Organisms ≥ 10–50 µm	Ind/ml	> 1.000	< 10	> 99 %
E-coli bacteria	cfu/ 100 ml	-	250	-
Entrococcus	cfu/ 100 ml	-	250	-

Chemical free



- Safe for crew, vessel and environment
- No chemicals logistics
- No hold time in ballast tanks
- Independent of salinity



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