



SEAREN 

The word 'SEAREN' is rendered in a large, bold, blue, sans-serif font. To its right is a circular logo icon, which is blue with a lime green ring inside, resembling a stylized eye or a lens.



WE HAVE TO KEEP IT CLEAN

CURRENT WATER TREATMENT METHODS ARE

1

COMPLEX



2

EXPENSIVE



3

**NOT
SUSTAINABLE**



OUR SOLUTION

THE



IS



SIMPLE
BY NATURE



EFFICIENT
BY DESIGN



RELIABLE
BY CONCEPT

MULTI-FUNCTIONAL TECHNOLOGY



WATER CIRCULATION

Low pressure pump (15,000 to 15 million gpd)



GAS EXCHANGE

CO₂, H₂S, O₂, N₂, CH₄, Radon, VOC...



PARTICLE EXTRACTION

0.1 to 100 microns



FOUNDING TEAM

THOMAS ANDREWS



CTO



VP Engineering

\$100M+

Defense



MSME
Mechanical
Engineering

EMMANUEL BRIQUET



CEO



25 Years

Entrepreneurial
Experience



United
Nations

Aquaculture
Industry

JOHN BROOKS



CFO



Controller

\$25m+

Corporate

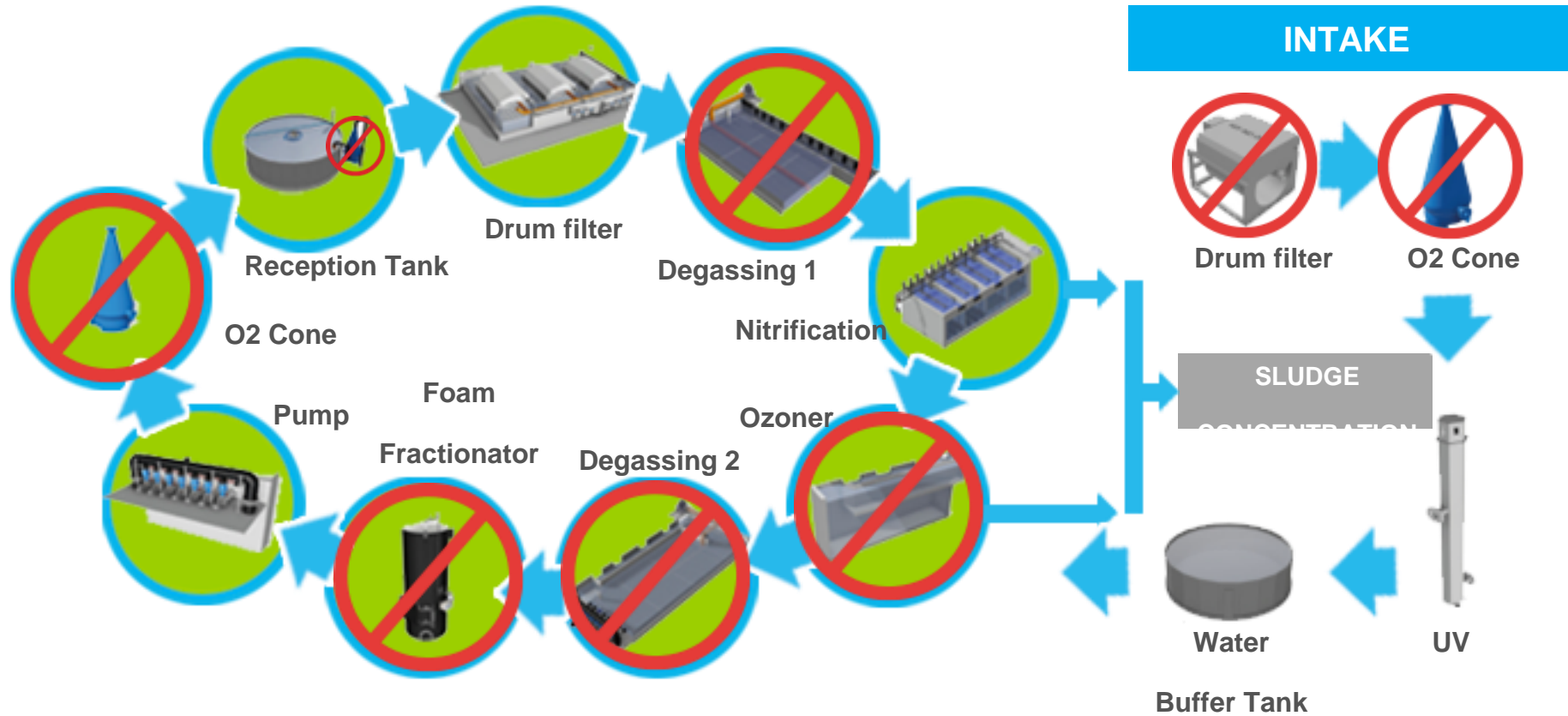


MBA

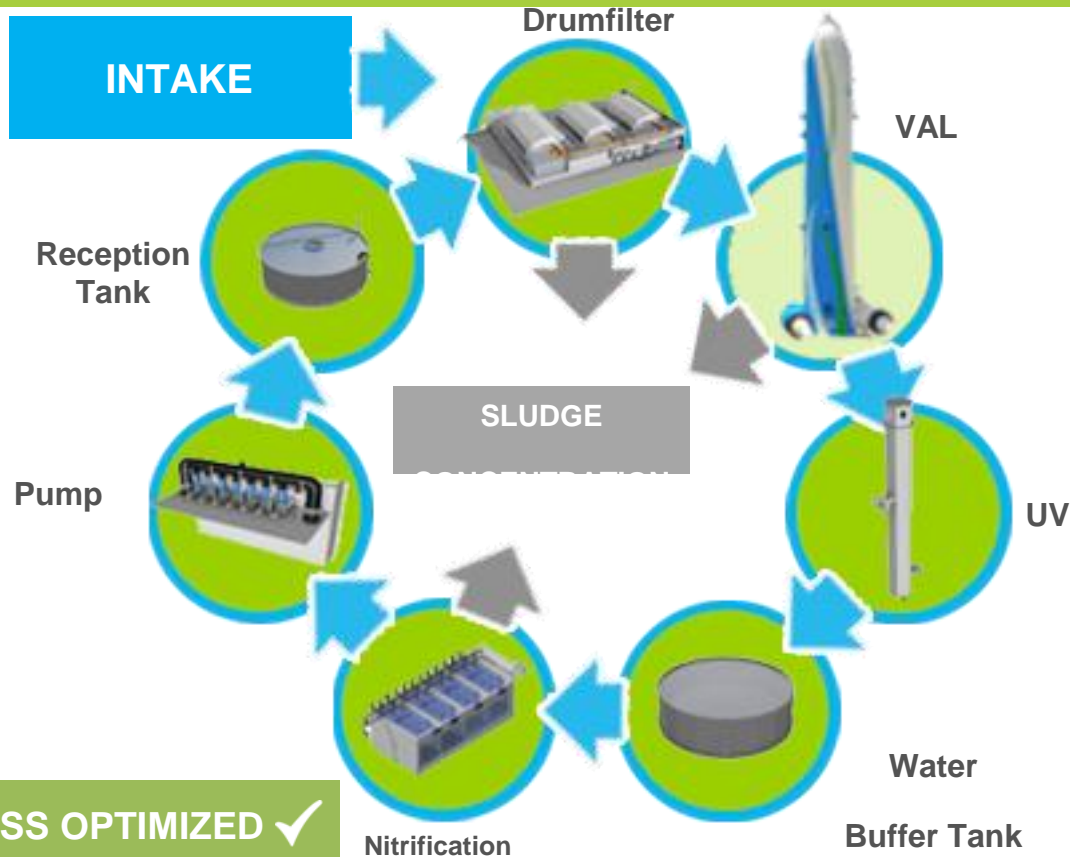
University of
Minnesota

**SIMPLIFIES
WATER
MANAGEMENT**

Standard Water treatment System



VAL BASED PROCESS



INTAKE

Drumfilter

VAL

**Reception
Tank**

SLUDGE

Pump

UV

**Water
Buffer Tank**

Nitrification

20 to 80 %

**Reduction in
capital costs**

20 to 80 %

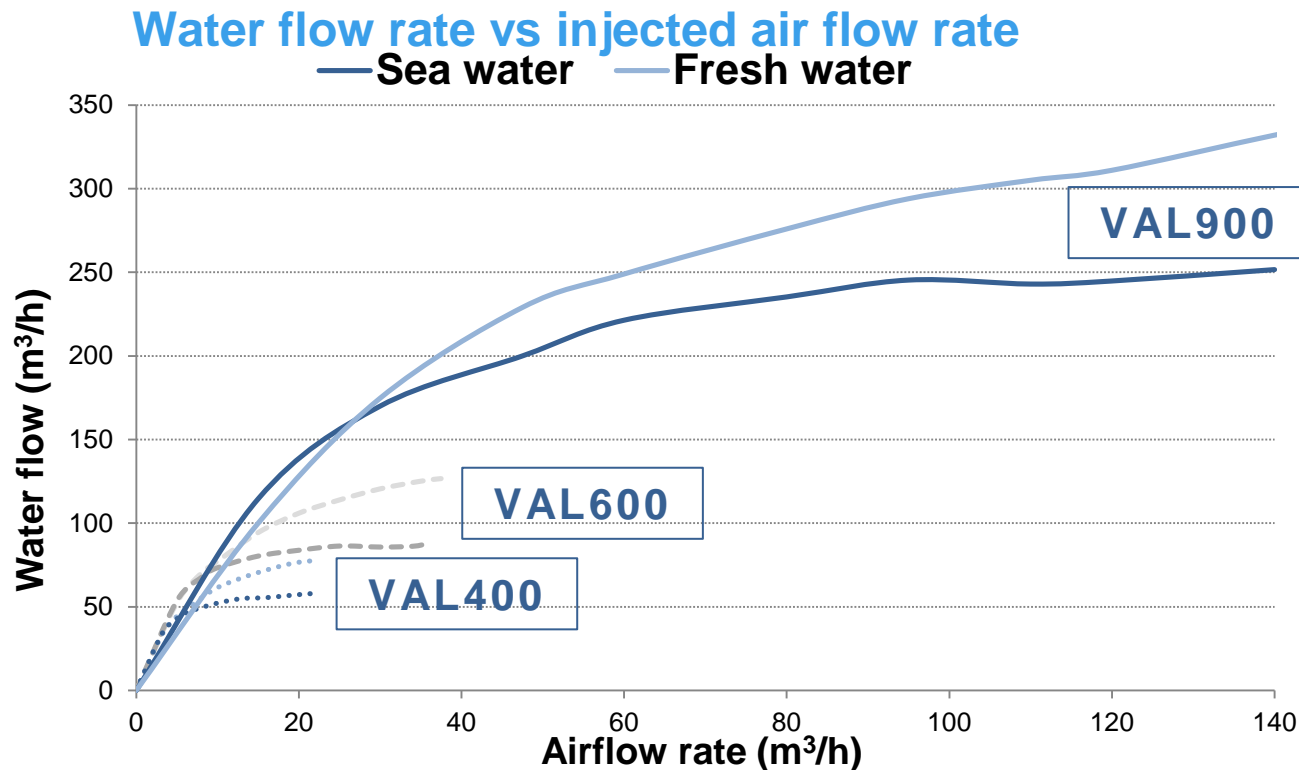
**Reduction in
operating costs**

Improved

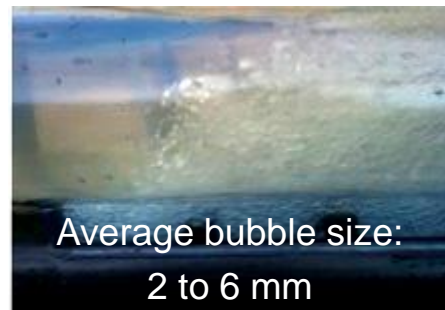
**Water quality
and reliability**

PROCESS OPTIMIZED ✓

WATER CIRCULATION



Fresh water



Sea water

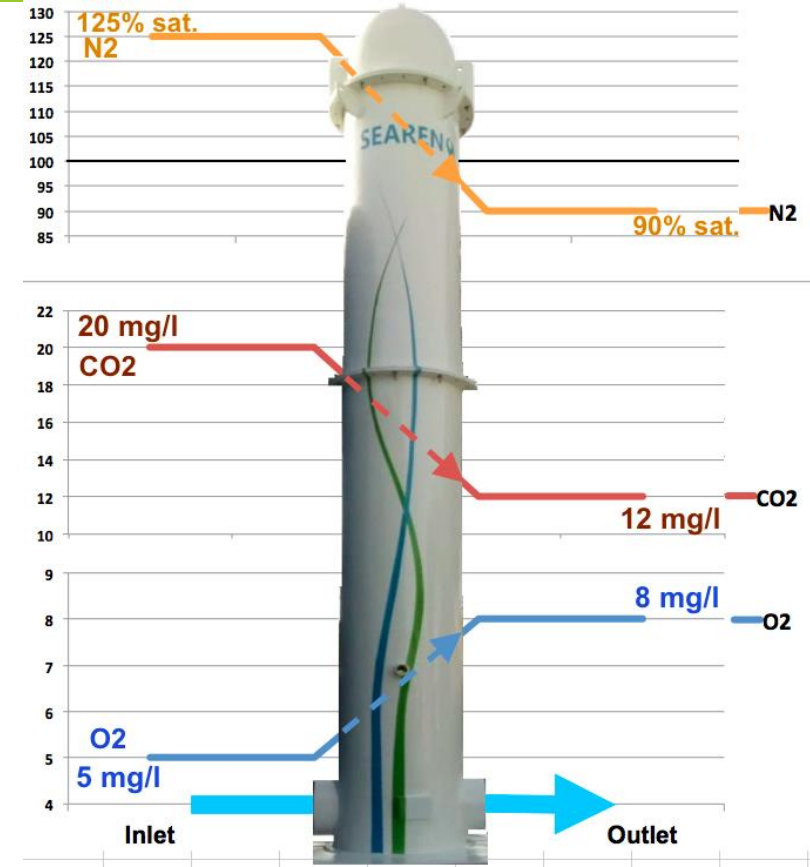


GAS EXCHANGE



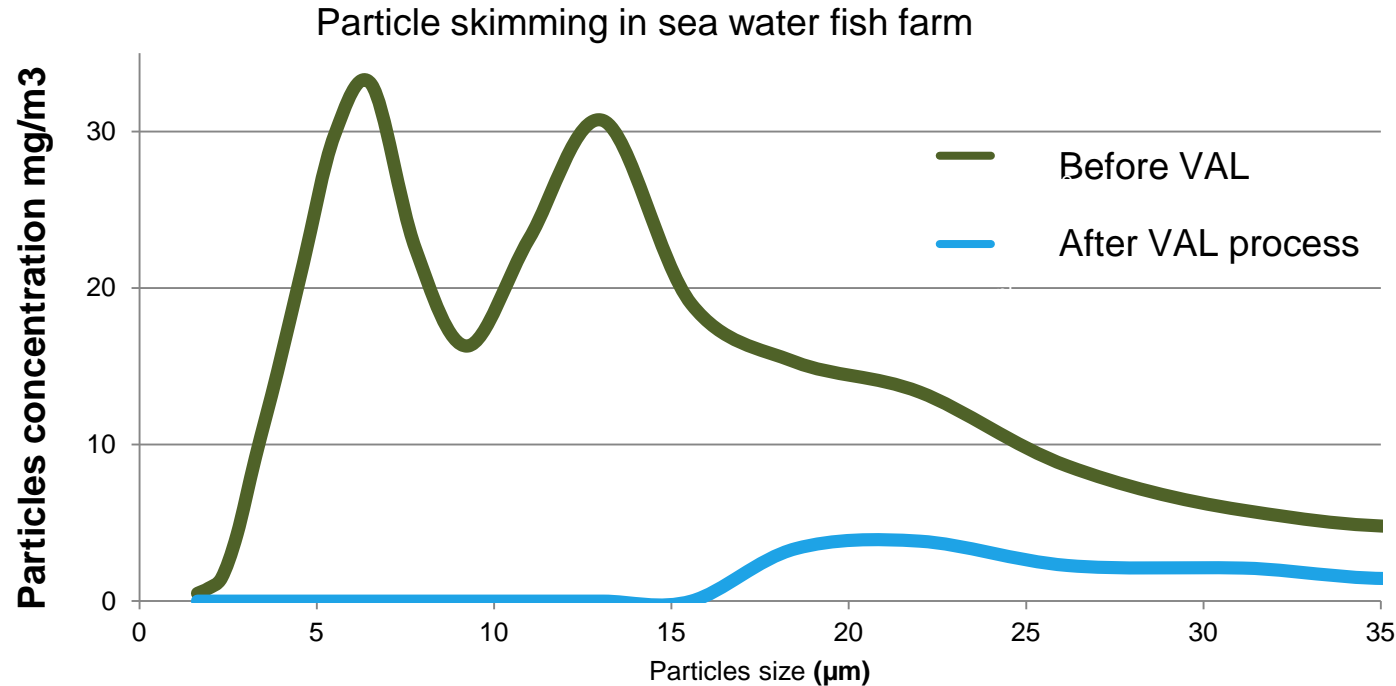
The VAL performs both gas stripping and dissolution

- **Gas are stripped** outside the operation area = less aeration
- Gaseous compounds are maintained under saturation level
- Low exchange Air/Water = low thermal balance required



PARTICLE EXTRACTION

Extraction of particles of size between **0.3 and 90 μm**

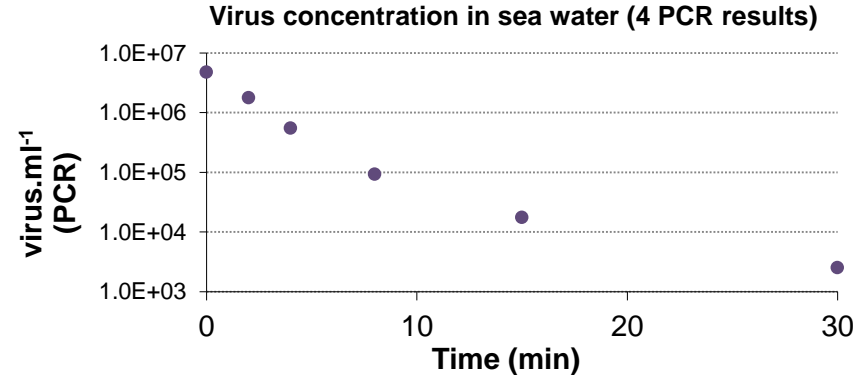
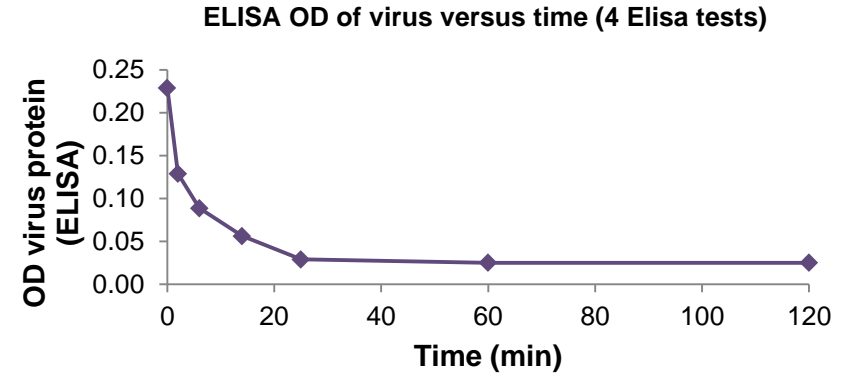
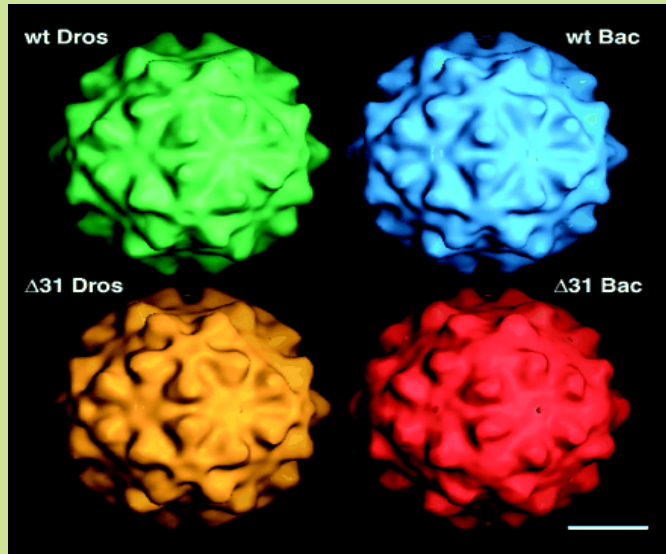


**TSS
Removal**

ADDITIONAL FUNCTION: BIO-SECURITY

(pathogens extraction)

- **Virus removal** (20 nm)
by foam fractionation:
Reduction of 3 logs



FISH FARMS

SEAREN'S FIRST TARGET MARKET

AQUACULTURE HAS
SURPASSED BOTH
WILD FISHING AND
BEEF PRODUCTION

NORTH AMERICAN
MARKET

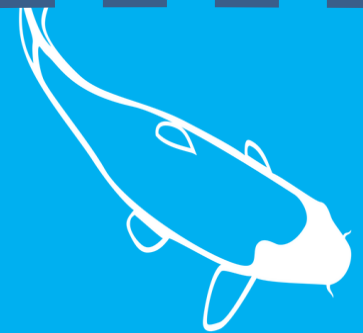
\$3.5
BILLION

ADDRESSABLE
MARKET

\$300
MILLION

2010

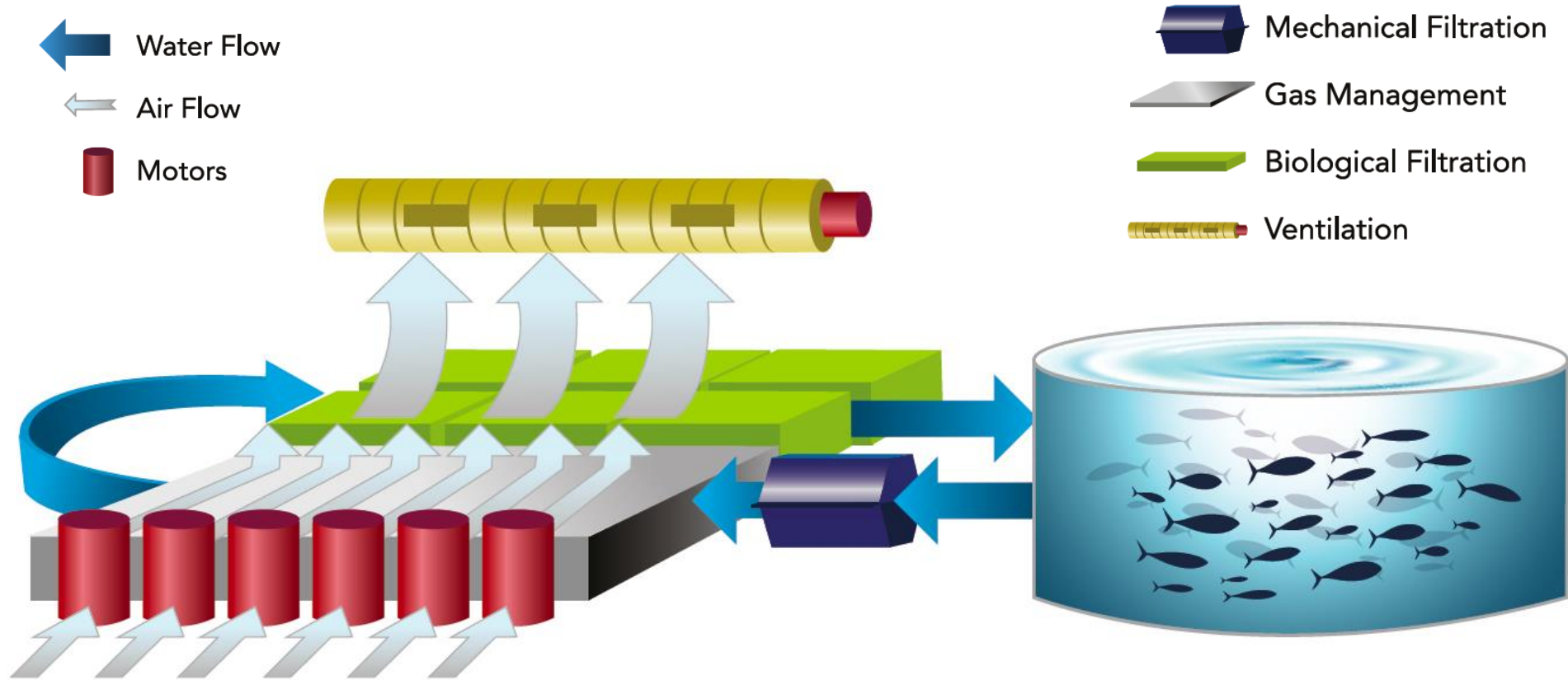
2005



VAL CLEANS WATER FOR MILLIONS OF FISH



CONVENTIONAL Recycled Aquaculture System

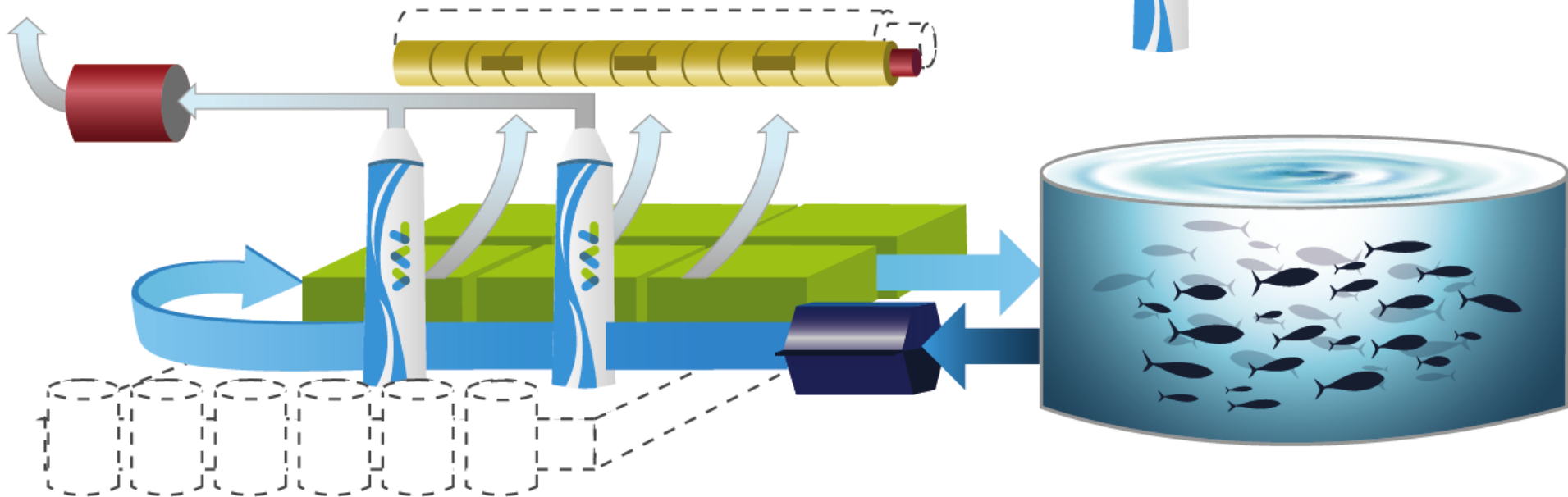


VAL™ BASED RAS

**Space And
Equipment Saved**



VAL:
Gas Management
+ Micro Filtration





**RETURN ON
INVESTMENT
IN MONTHS**

**INCREASE IN
FISH SURVIVAL**

PUBLIC AQUARIUMS & ZOO



N.A. MARKET
500+ businesses
\$3.5B

ADDRESSABLE
MARKET

\$200M

References:

Oceanopolis (Brest, France)

Seaquarium (Montpellier, France)

PARTICLE EXTRACTION

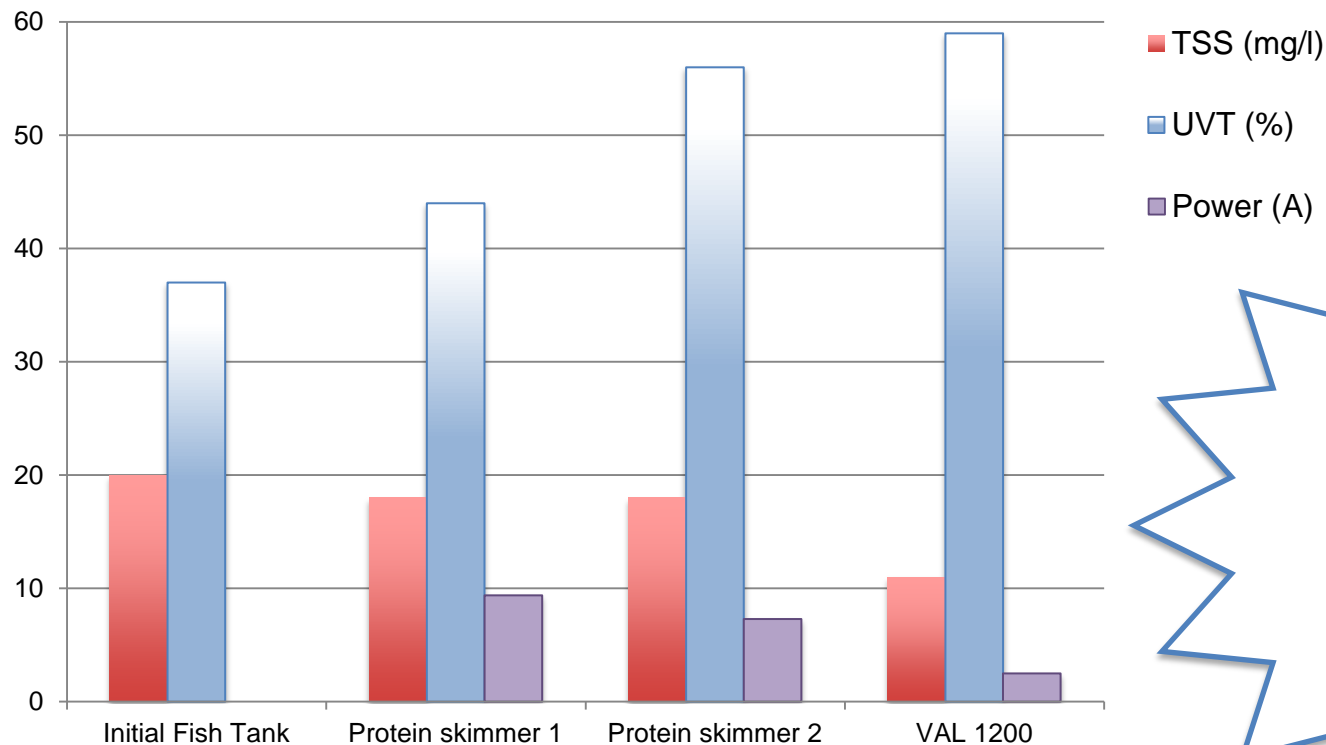


VAL foam fractionation



	Tank before VAL	In foam	Tank after VAL
Optical density	0.2	0.6	0.08
UV transmittance	57%	n.a	80%
POM concentration (mg/L)	20	75	7.7

VAL vs. FOAM FRACTIONATORS (protein skimmers)



RESULTS

The VAL™ is 45% more effective using 66% less energy than the best foam fractionator

**EFFICIENT
PRODUCTIVE
SUSTAINABLE**



INDUSTRIAL



MUNICIPAL



OIL & GAS

PUBLIC & INDUSTRIAL WATER



Sevilla Spain



Phoenix AZ

US MARKET
\$50B

ADDRESSABLE MARKET

\$2.5B

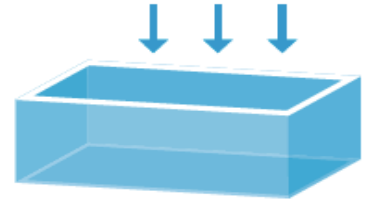
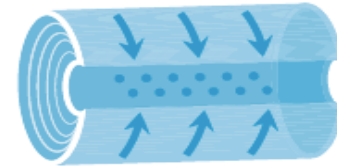
PUBLIC & INDUSTRIAL WATER: VAL POSITIONING (example with desalination)

Ocean Water

STEP 1
Pre-Treatment

STEP 2
Reverse Osmosis

STEP 3
Conditioning+disinfection



Leftover high-salinity
water discharged
as brine.

Pre-filtration

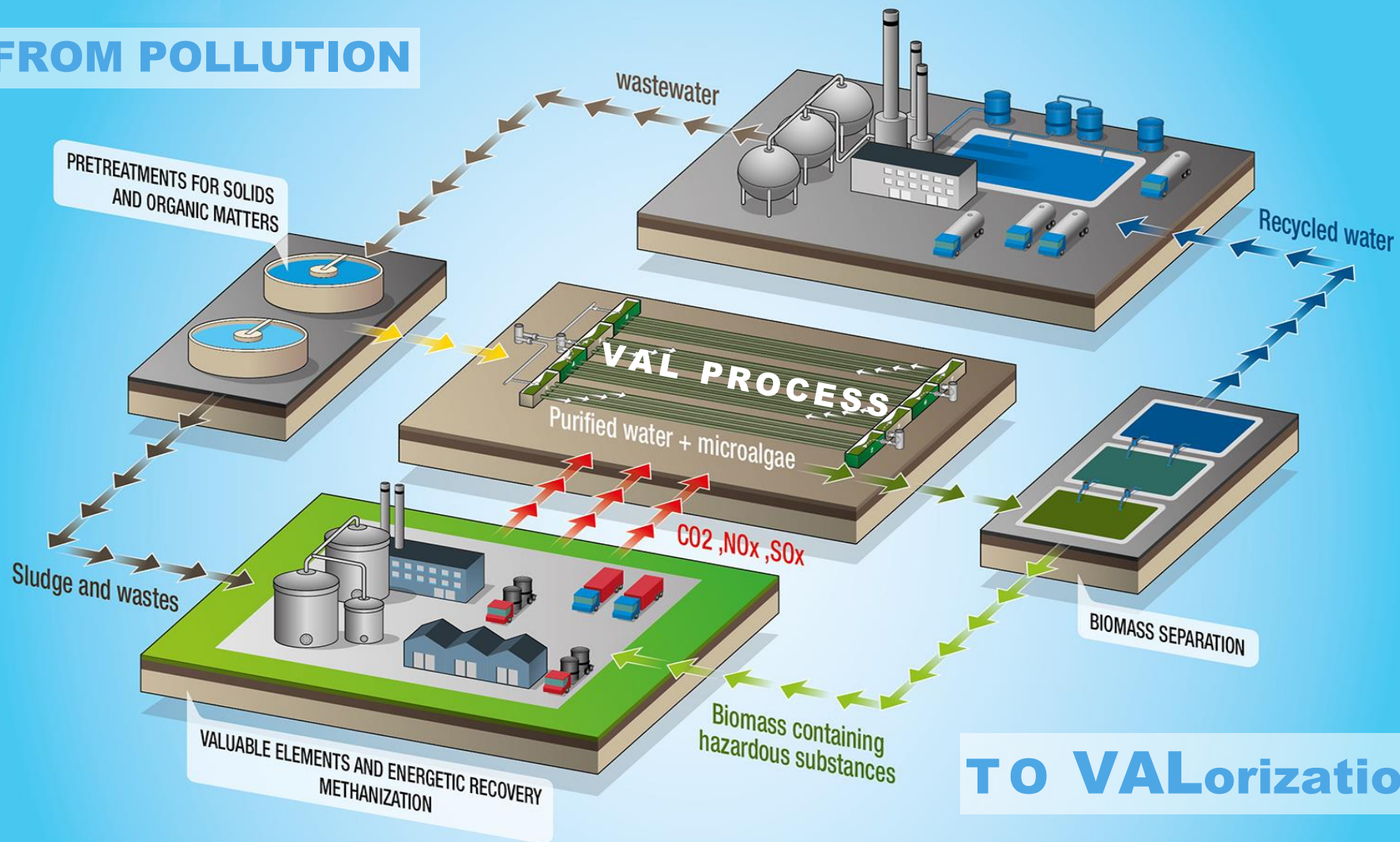
TSS, SDI, micro-algae, VOCs and de-oiling.

Post-treatment

Aeration, degassing and mixing.

Higher efficiency of RO, lower maintenance and overall lower OPEX

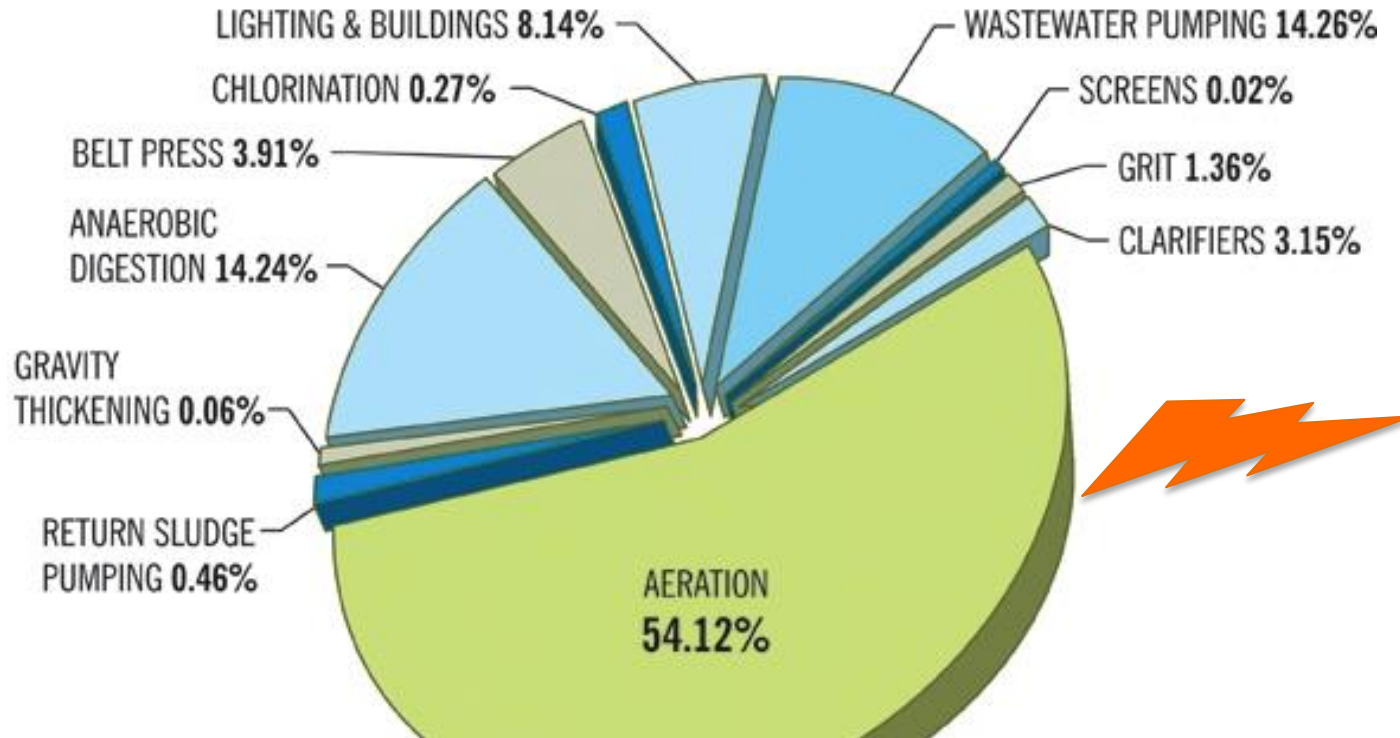
FROM POLLUTION



**EASY TO
LEARN AND
OPERATE**

ENERGY CONSUMPTION

Average energy consumed by process in a wastewater treatment plant



Energy required
for AERATION:
30 to 200 W/m³
Compared with
3 to 10 W/m³
with the VAL

SUB SEGMENT / NICHE MARKET

VOC STRIPPING FROM GROUND WATER



**Required
on 700+ Superfund
sites in the U.S.**

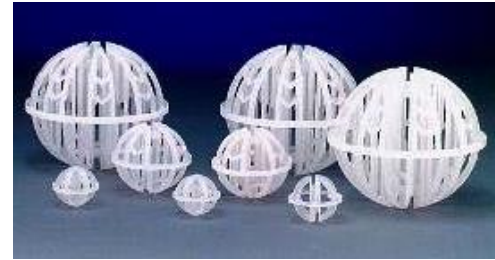


The classical gas exchange technologies: STRIPPING TOWERS

Method: A film of water flows over a high surface area packing.

Disadvantages:

- Flow turn-down difficult
- High footprint
- High maintenance due to clogging
- Short circuiting
- **Decrease in efficiency**
- Multiple engines per unit
- Ratio Air to Water: **1 for 8 to 25**



New Packing

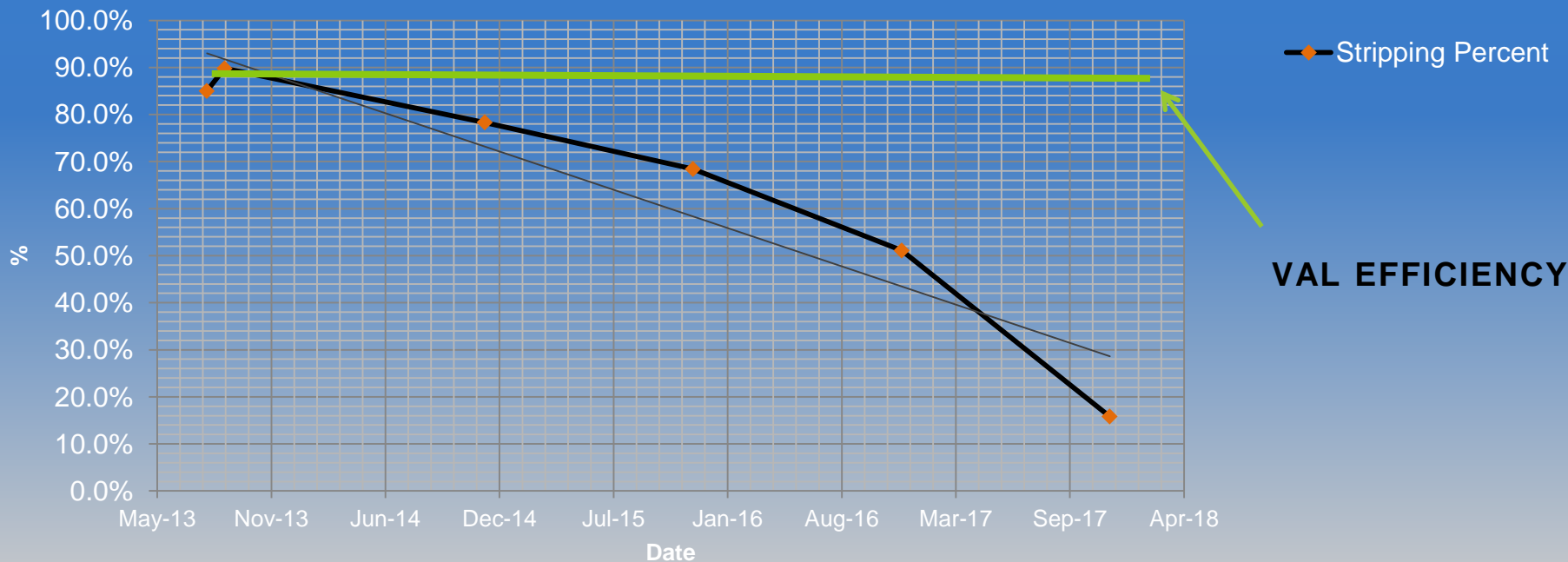


3 years old packing

Stripping Tower Performance Overtime

Stripping tower performance can degrade by about 15% per year.

In some cases, the performance is reduced to about half the starting value, after only 3 years



OIL & GAS



FUNCTIONS

SDI reduction ✓

De-oxygenation ✓

VOC stripping ✓

De-oiling ✓



US MARKET
\$20B

ADDRESSABLE MARKET

\$1B

SDI REDUCTION (O&G)

SDI reduction:

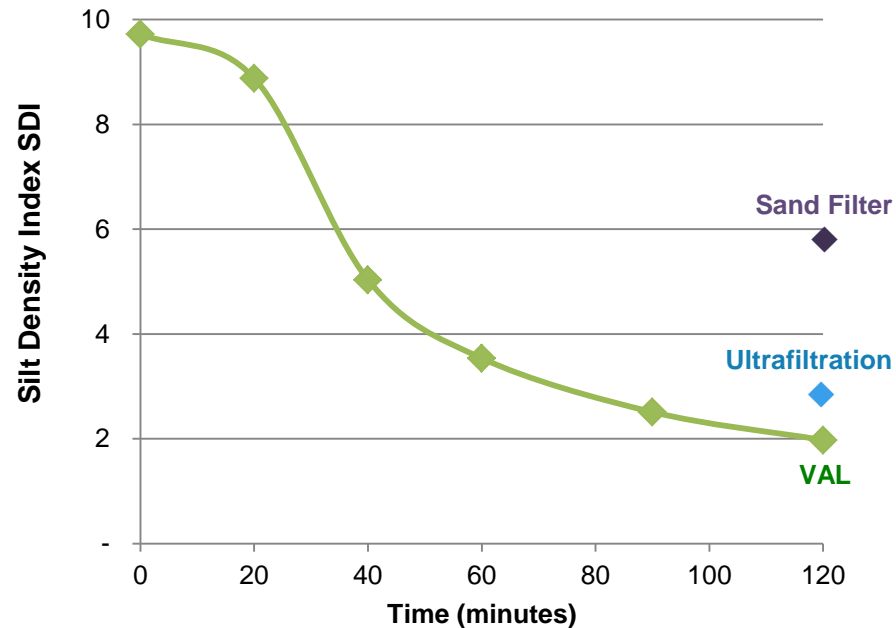
from 10 to 2

The **SDI** (Silt Density Index) is used to determine the fouling and clogging potential of particulate and fine colloidal materials that may be present in the feed-water.

The Oil & Gas industry typically uses feed-water with $SDI < 3$.



SDI reduction in sea water vs “conventional” technologies



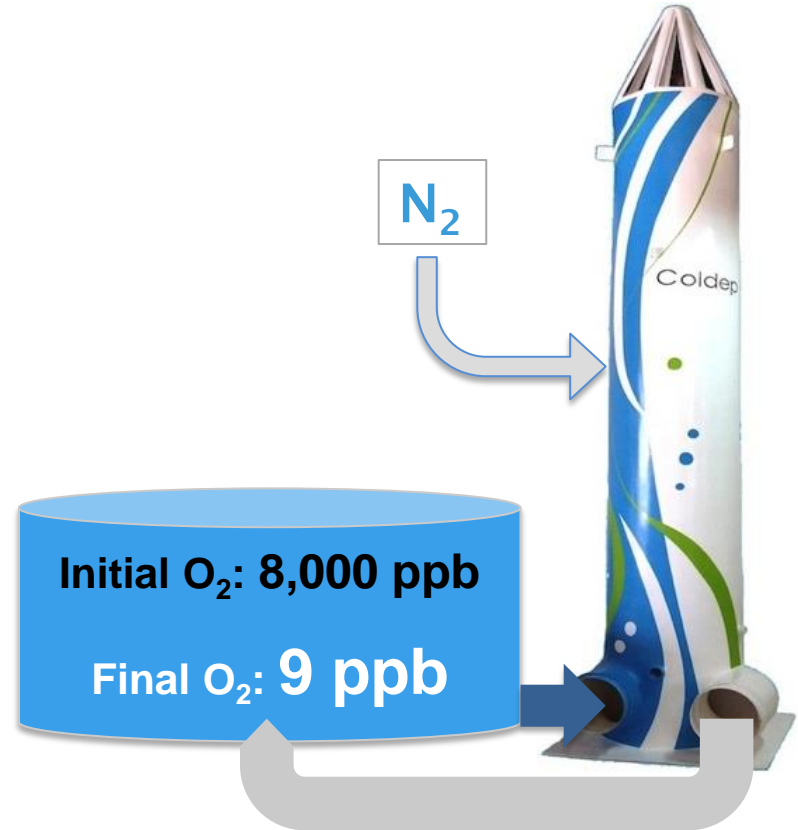
DE-OXYGENATION

Reduction of Oxygen*

from 8,000 to 9 ppb

* **Dissolved oxygen** removal from water for injection is a common practice in water-flooding, Improved Oil Recovery (IOR) and Enhanced Oil Recovery (EOR).

Oil & Gas industry typically tries to reach 10 ppb of dissolved Oxygen without the use of chemicals.



DE-OILLING

**Initial discharge
water**



VAL

**99% water
reclamation**



**95 % of oil
extracted into
1% of volume**



INITIAL

Oil concentration: 500 ppm
Transmittance: 63 %

FINAL

Oil concentration: 20 ppm
Transmittance: 98 %

EXTRACTED

Oil concentration:
50,000 ppm

**NO FILTERS
OR PARTS
TO WEAR OUT**

BENEFITS



**Multifunctional
Device**



**Reduced
Energy
Usage**



**Higher
Profitability**



**Clog
Resistant**



**Environmentally
Friendly**



**Improved
Water
Quality**



**Simple
Maintenance**



**High
Reliability**



**No
Consumables**



**Increased UV
Transmittance**



**Enhanced
Bio-security**



**Lower
Operational
Risk**

Examples of setup:



Trough tank



Above tank



In line



In tank

Range of VAL: 45 to 6,600 gpm

	VAL 400	VAL 600	VAL 900	VAL 1200	VAL 1400	VAL 2000 (new in 2020)
Diameter	40 cm 18 in.	60 cm 24 in.	90 cm 36 in.	120 cm 48 in.	140 cm 56 in.	200 cm 80 in.
Maximum flow in gas exchange mode	50 m ³ /h 220 gpm	135 m ³ /h 600 gpm	300 m ³ /h 1,300 gpm	550 m ³ /h 2,400 gpm	680 m ³ /h 3,000 gpm	1,500 m ³ /h 6,600 gpm
Optimum flow in particle extraction mode *	10 m ³ /h 45 gpm	23 m ³ /h 100 gpm	50 m ³ /h 220 gpm	100 m ³ /h 440 gpm	120 m ³ /h 530 gpm	270 m ³ /h 1,200 gpm

* The flow rate, in particle extraction mode, can be adjusted from 30% to 300% of the one indicated here

100+ VALs has been set up on 40+ locations



Intellectual Property

3 patents:

Patent 1: IFREMER-INSA

✓ in the EU and USA

Ends in 2027

Patent 2: IFREMER-INSA

✓ in the France + Brazil

Final phase in Canada

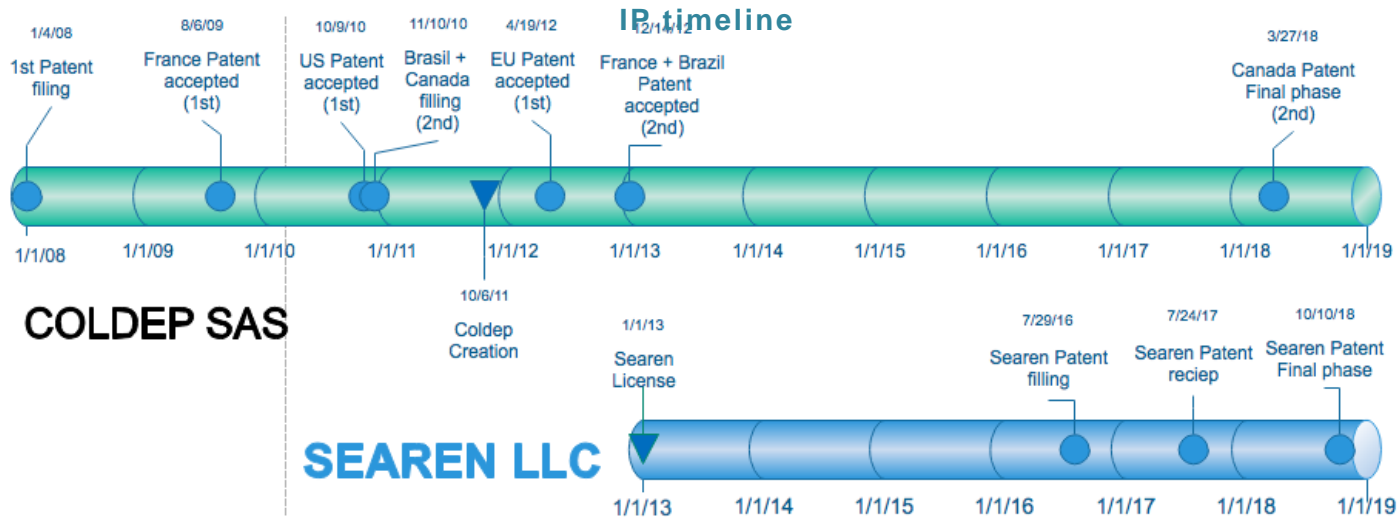
Ends in 2030

Patent 3: SEAREN

Final phase

Will end in 2036

- COLDEP holds (from IFREMER-INSA) the global license for patents 1 & 2
- SEAREN holds (from COLDEP) the exclusive license in the Americas, for patents 1 & 2 (backed by IFREMER-INSA)
- SEAREN has filed patent 3, territory will be determined within 3 years



LONG TERM STRATEGY

	2017	2018	2019	2020	2021	2022	2023	2024
AQUACULTURE	Validation		Sales					
MUNICIPAL	Test	Validation		Sales				
INDUSTRIAL	Test	Validation		Sales *		* Potential for spin-off		
OIL & GAS	Test	Validation *						





* Potential for spin-off

THANK YOU



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AES 1th & 2nd award winner



CONFLUENCE

WATER TECHNOLOGY INNOVATION CLUSTER
OHIO RIVER VALLEY REGION



PIPELINE
Class 2017 winner