Børge Søraas
Vice President Landbased - Aquaoptima
Scale Aquaculture

DEFINING AQ INDUSTRY THROUGH 40 YEARS OF EXPERIENCE

STEINSVIK

aqualine

AQUAOPTIMA

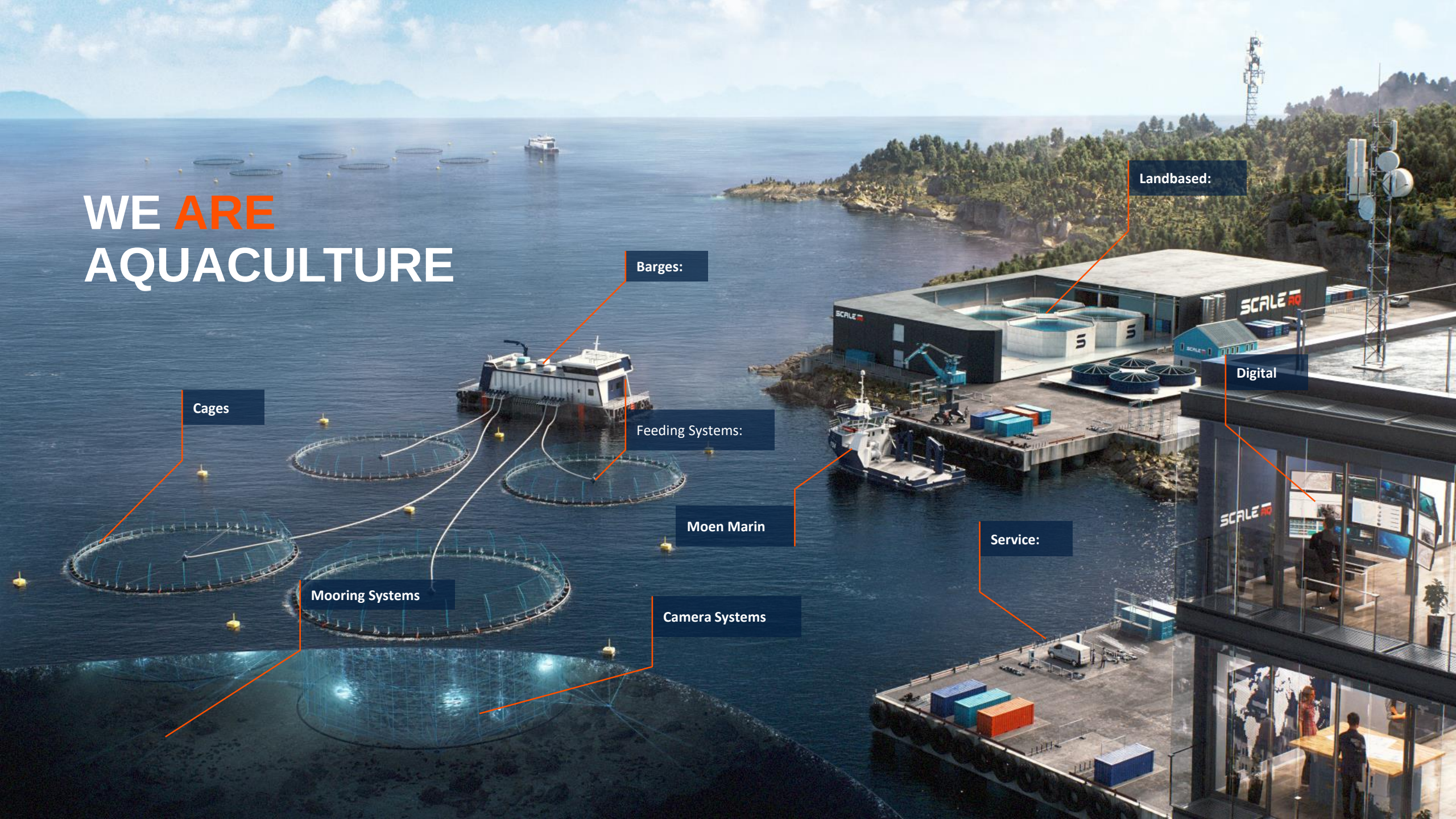
We deliver a complete value chain

Seabased AQ

Landbased AQ

Digital

Service


WE ARE
AQUACULTURE
Barges:
Landbased:
Cages
Feeding Systems:
Digital
Moen Marin
Service:
Mooring Systems
Camera Systems

WORLDWIDE

Faroe Islands - Agent
Klaksvik

Iceland - 1 employee
Reykjavik

Canada - 20 employees
Campbell River
New Brunswick
Newfoundland

Scotland - 14 employees
Fort Williams
Shetland

Spain - 4 employees
Alicante

Turkey - 8 employees
Izmir

Chile - 200 employees
Puerto Natales
Puerto Varas

Norway - 350 employees
Bergen
Bømlo
Frakkagjerd
Frøya
Harstad
Sandnessjøen
Skodje
Sykkylven
Tovik
Tromsø
Trondheim

Vietnam - 280 employees
Hanoi
Nha Trang

Dubai - UAE - Agent
Dubai

Tasmania - 15 employees
Hobart

Landbased AQ

Turn-key system for optimal water quality

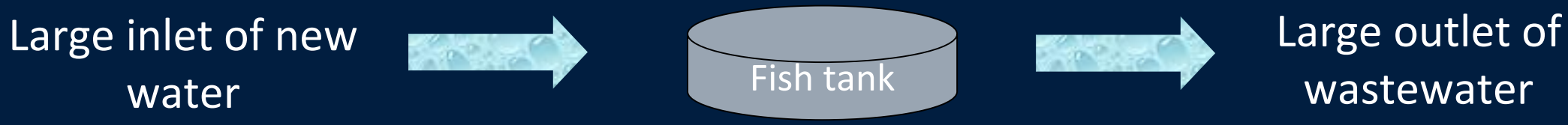
About ScaleAQ Landbased

History of AquaOptima

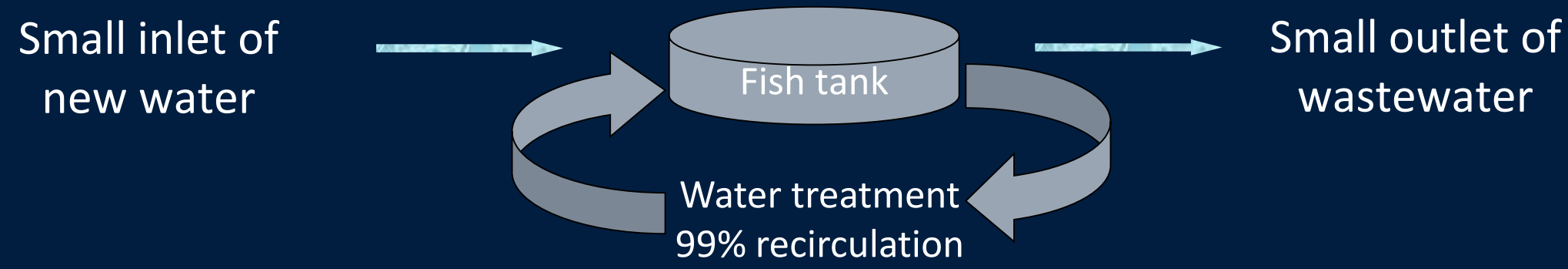
- Based on comprehensive research activities in SINTEF in the period 1985-1993
- Developed industry products and own technology for intensiv landbased farming

Landbased farming

Traditional flow through system (FT)

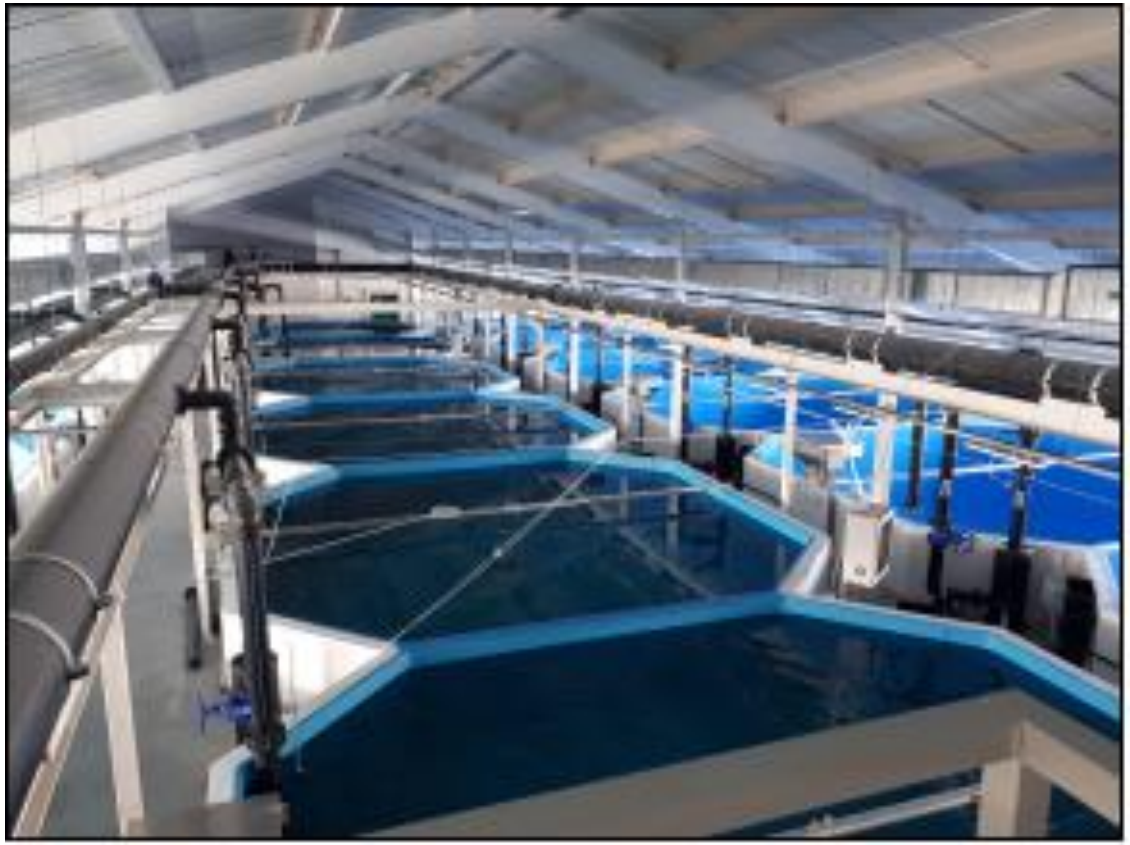


Resirculating aquaculture systems (RAS)



Why RAS?

- Reduced water consumption
- Collection of sludge and waste
- Control of water quality
- Biosecure production
- Predictable production
- Shorter time in the sea, less parasites and diseases
- Large production on a small footprint
- Production near the consumer



Water quality demands

Parameter	Safe level (salmonids)
TSS (particles)	< 15 mg/L
TAN (NH_4^+-N and NH_3-N)	< 2 mg/L
NH_3 – N	< 0.012 – 0.025 mg/L
NO_2^- - N	< 0.1 mg/L
NO_3^- - N	< 100 mg/L
Dissolved O_2	80 - 100% saturation
CO_2	< 15 mg/L
pH	7 – 7.5
Density	< 80 kg/m^3
Temperature	12-14 °C for Atlantic salmon, 15-17 °C for rainbow trout

Landbased AQ

Focus on:

- Optimal and efficient production of fish
- Particle removal and good water quality
- Efficient and stabile CO_2 removal
- Optimal tank hydrodynamic
- Knowledge transfer – innovative methods for training

Particle removal


Particles and organic material lead to:

- Reduced efficiency in bioreactor

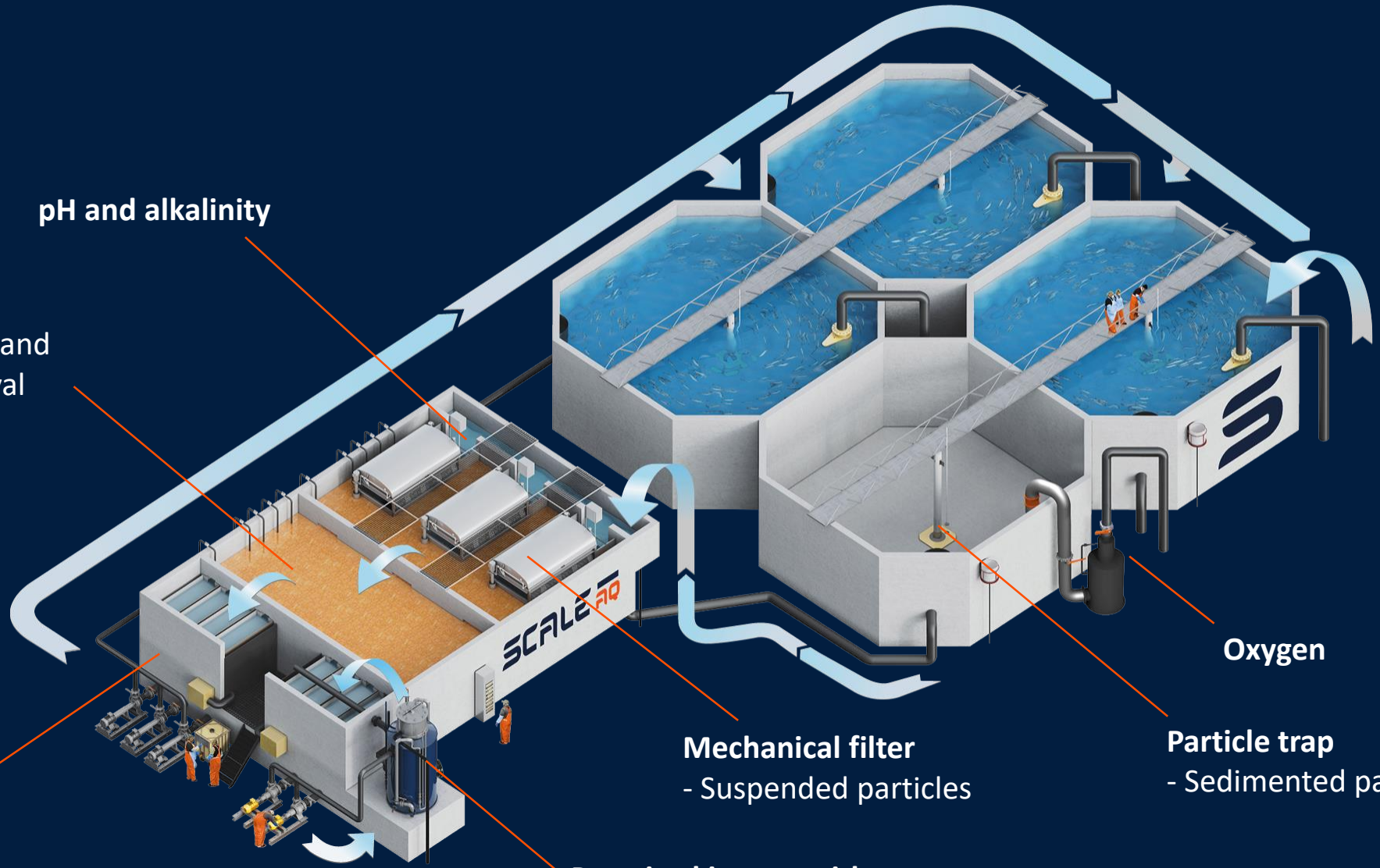
NH_3/NH_4^+ —(Bacteria, O_2)→ NO_2^- —(Bacteria, O_2)→ NO_3^-

Organic material —(Bacteria, O_2)→ CO_2

- Reduced efficiency in CO_2 – stripper
- Leakage of nutrients
- Increased biofilm growth and risk of sludge accumulation
  - H_2S risk and unstable microflora
- Increased risk for pathogens
- Increased O_2 demand
- Reduced clarity (and control)

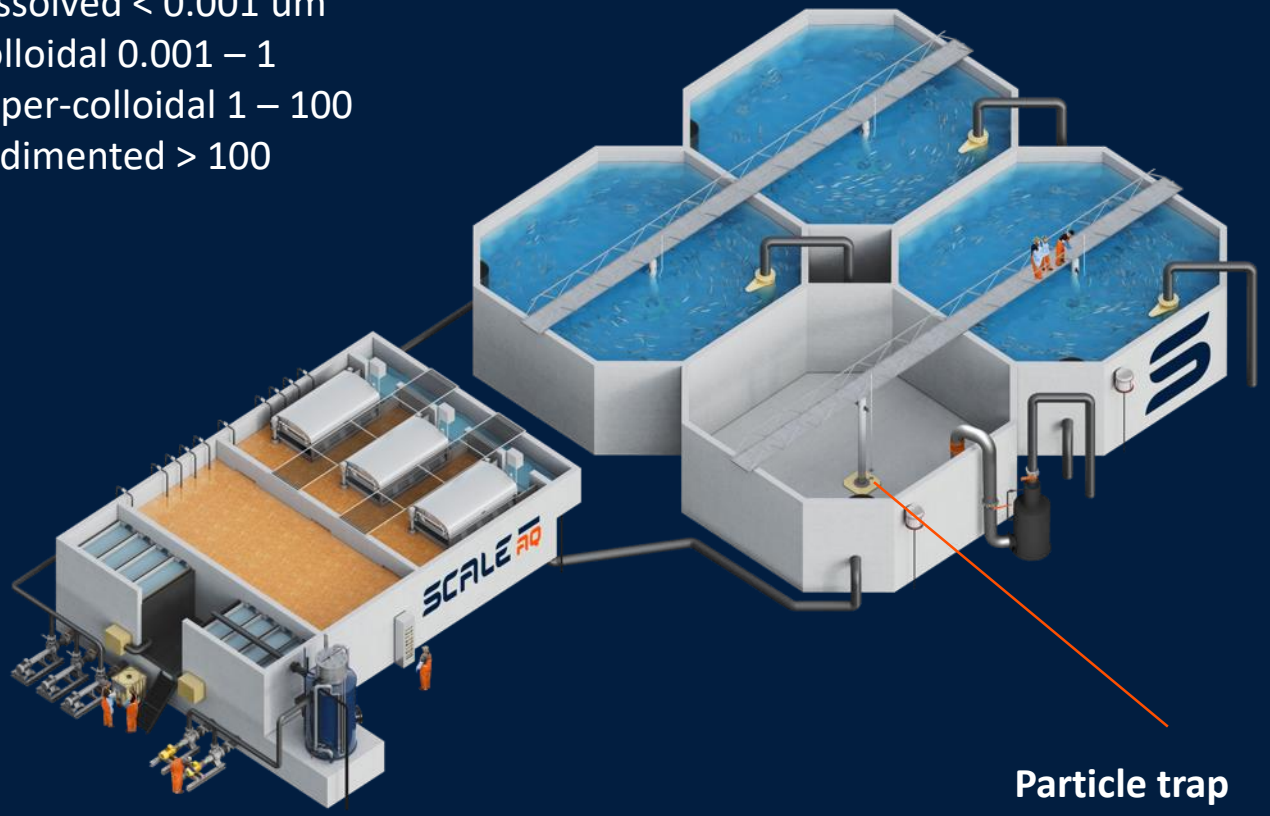



RAS – rearing tanks and water treatment



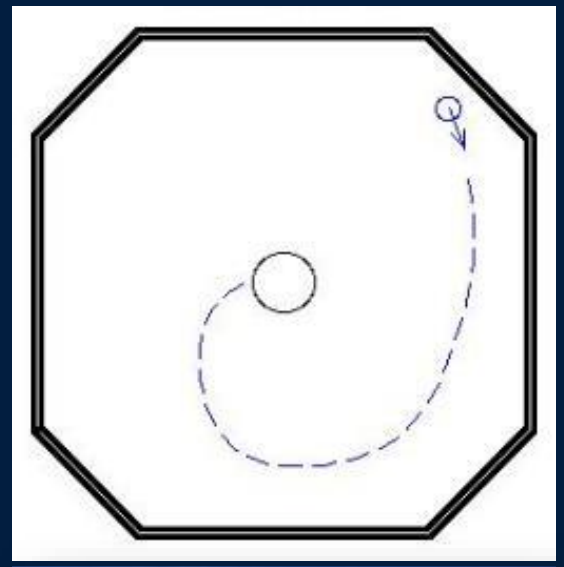
Particle trap in the centre of the tank

Size distribution:
- Dissolved < 0.001 um
- Colloidal 0.001 – 1
- Super-colloidal 1 – 100
- Sedimented > 100

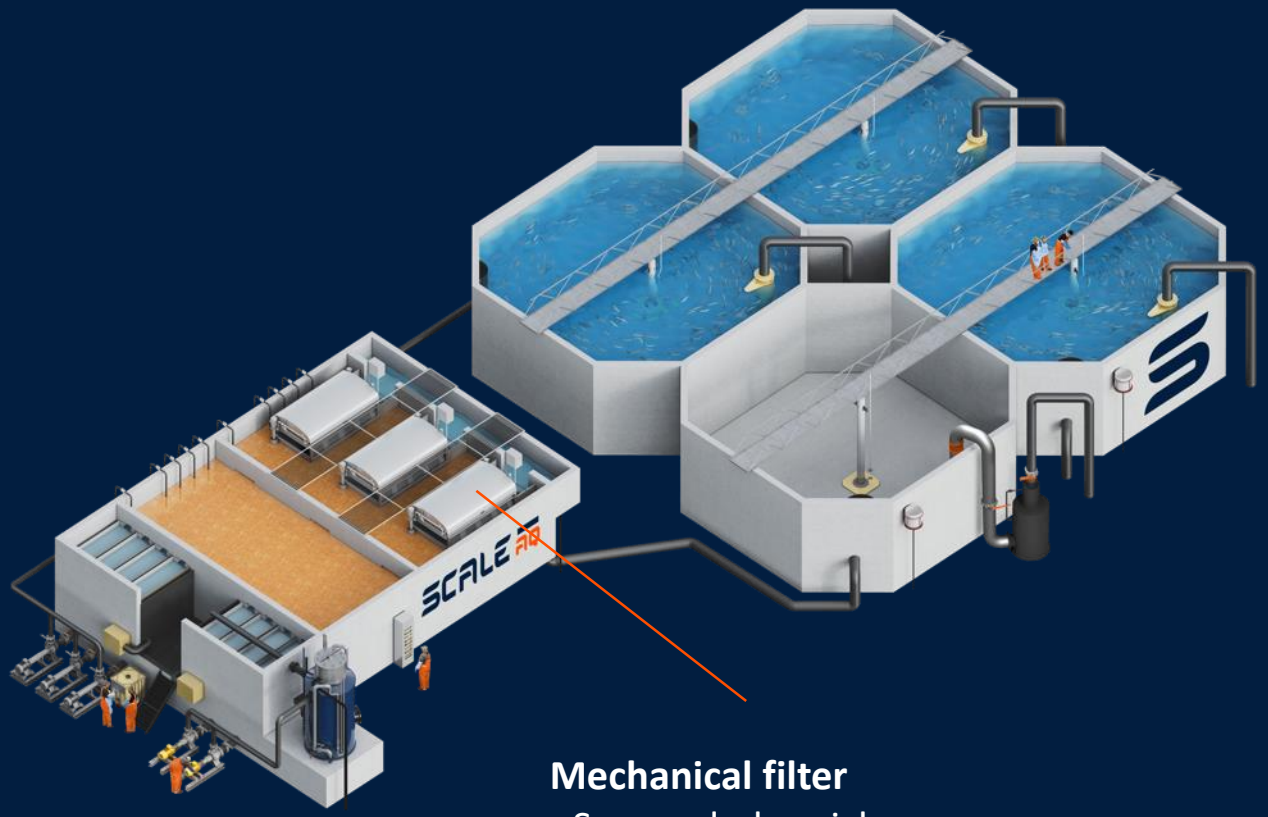


Particle trap
- Sedimented particles

Particle

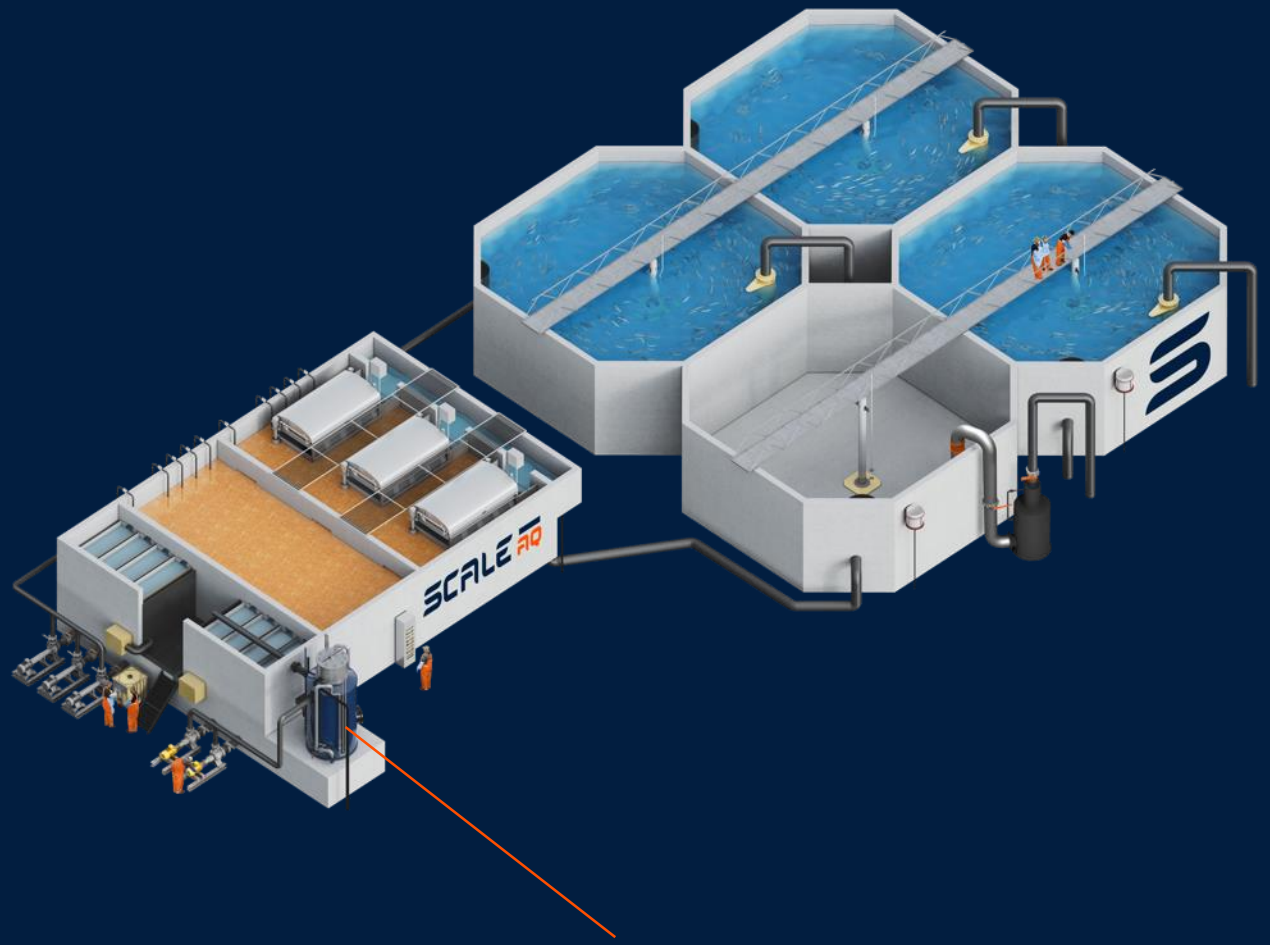


Mechanical filter

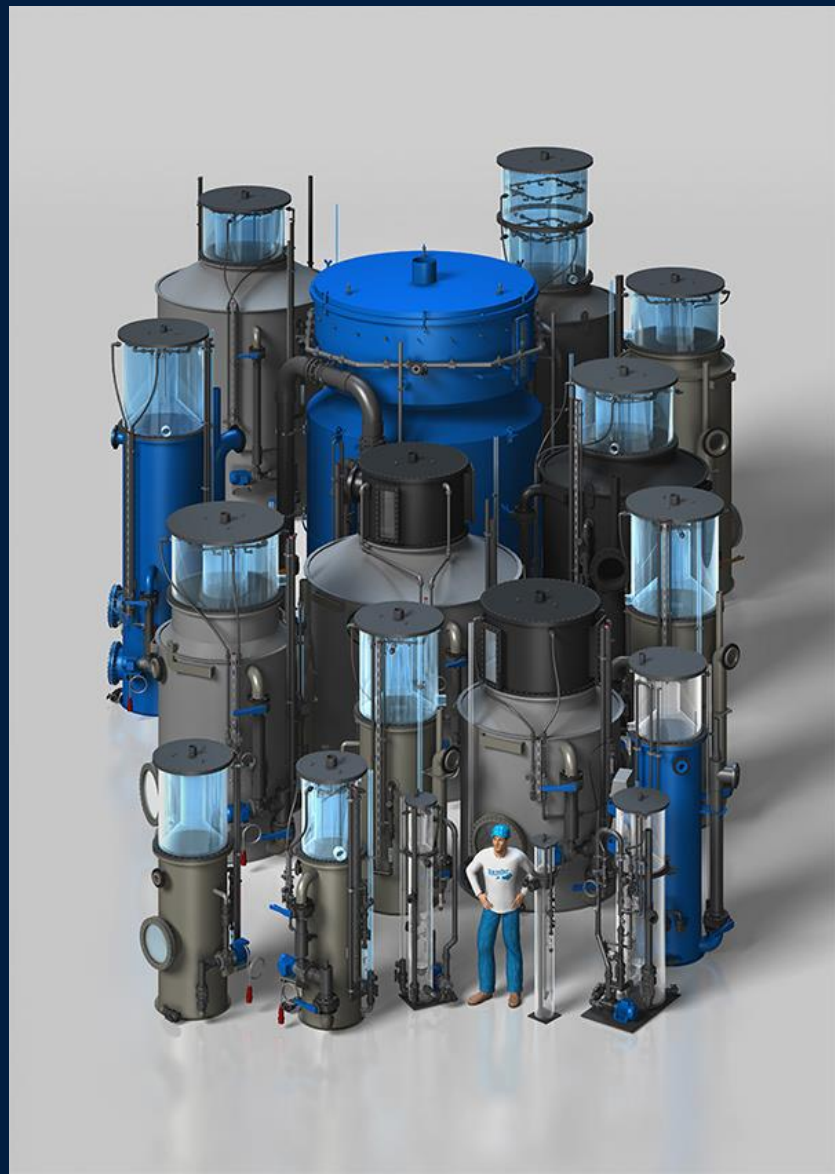


Mechanical filter
- Suspended paricles

Protein skimmer with ozone



Protein skimmer with ozone
- Fine particles and dissolved organic material



Bioreactor - nitrification

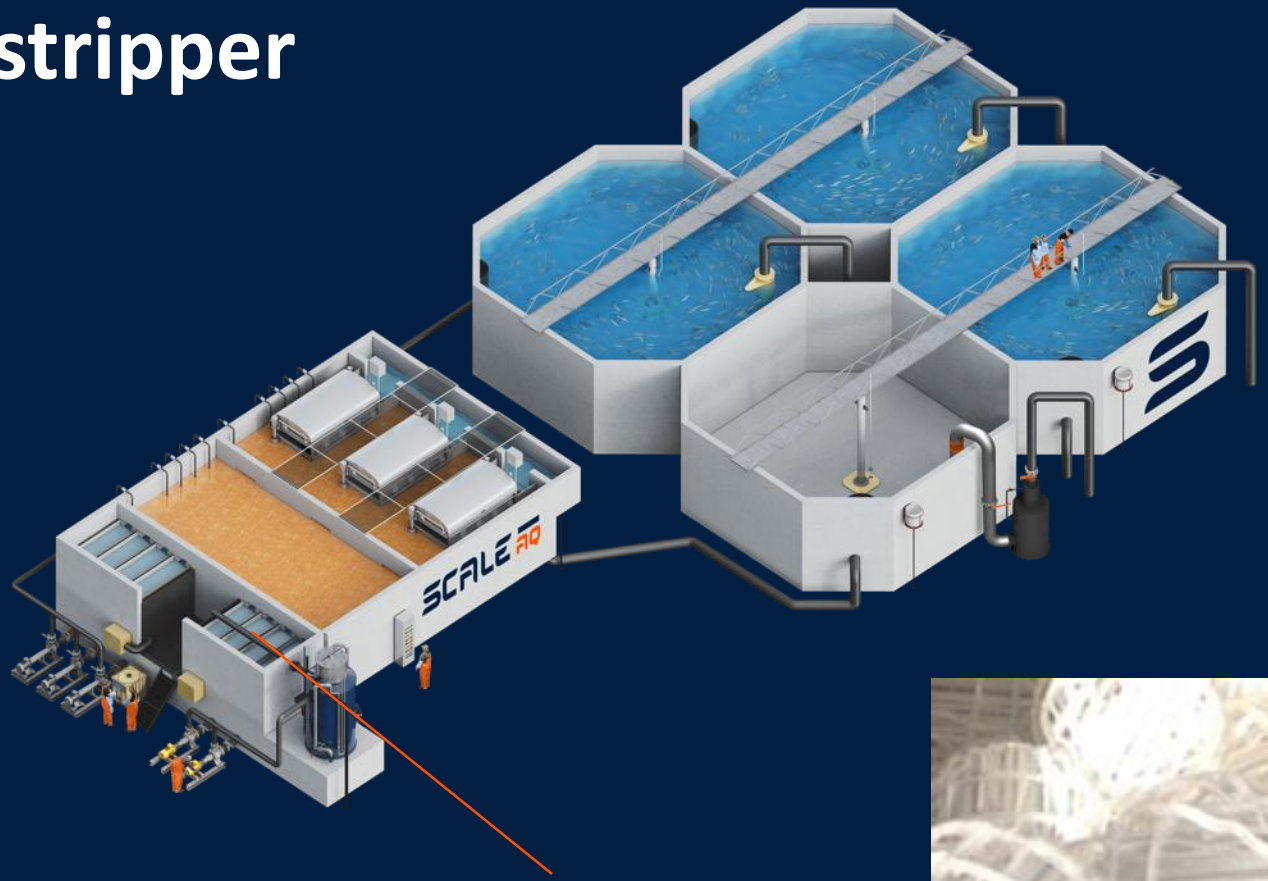
Bioreactor
- Ammonia -and nitrite removal

NH_3/NH_4^+ —(Bacteria, O_2)→ NO_2^- —(Bacteria, O_2)→ NO_3^-

Toxic for fish

Less toxic for fish

CO_2 - stripper



Degasser
- Removes CO_2 and N_2

- The most important factor for stabile and high degasser effect is a clean aeration media
- Scale has developed a self-cleaning CO_2 stripper

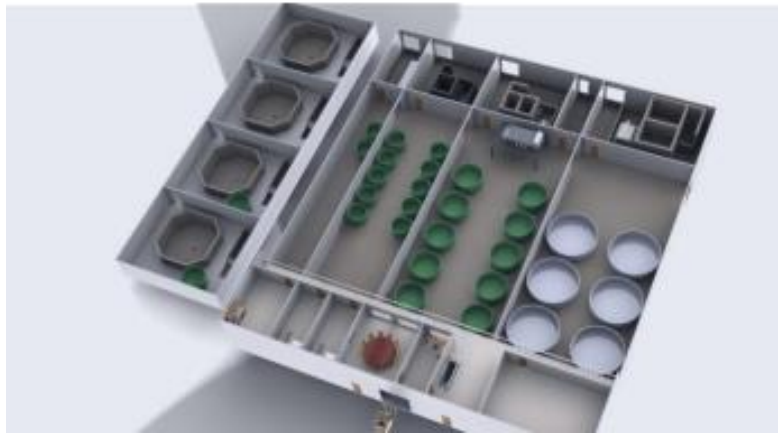
ScaleAQ Landbased, delivers worldwide

- For more than 25 years AquaOptima has delivered RAS facilities worldwide, for a variety of species, in tropical and arctic environments, in freshwater and seawater

Eel – Portugal

Shrimps - Ecuador

Whitefish and sturgeon – Siberia/Russia



Barramundi – Yapen, Indonesia

VIKAN

- RAS from hatching to post-smolt
- Salmon (300 g) and trout (150 g)
- Total rearing volume of 7 000 m^3
- 6 200 kg feed per day
- Finished in April 2020


www.bolkan.no

Vikan

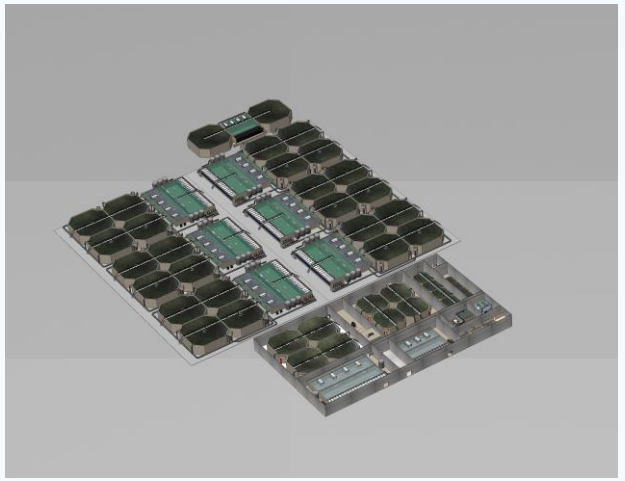
Potential for Black Sea Region- RAS- Salmon and Trout

- Seacage production between June and November is difficult
  - High mortality of fish in the warm period
  - Producer is out of the market for many months

- RAS based production will achieve several benefits
  - Don’t need risky dam and lake production for smolt
  - Optimal production conditions
  - Better fish welfare and lower FCR
  - Good planning for market supply of fish

2 potential strategies

SMOLT RAS → GROWOUT RAS



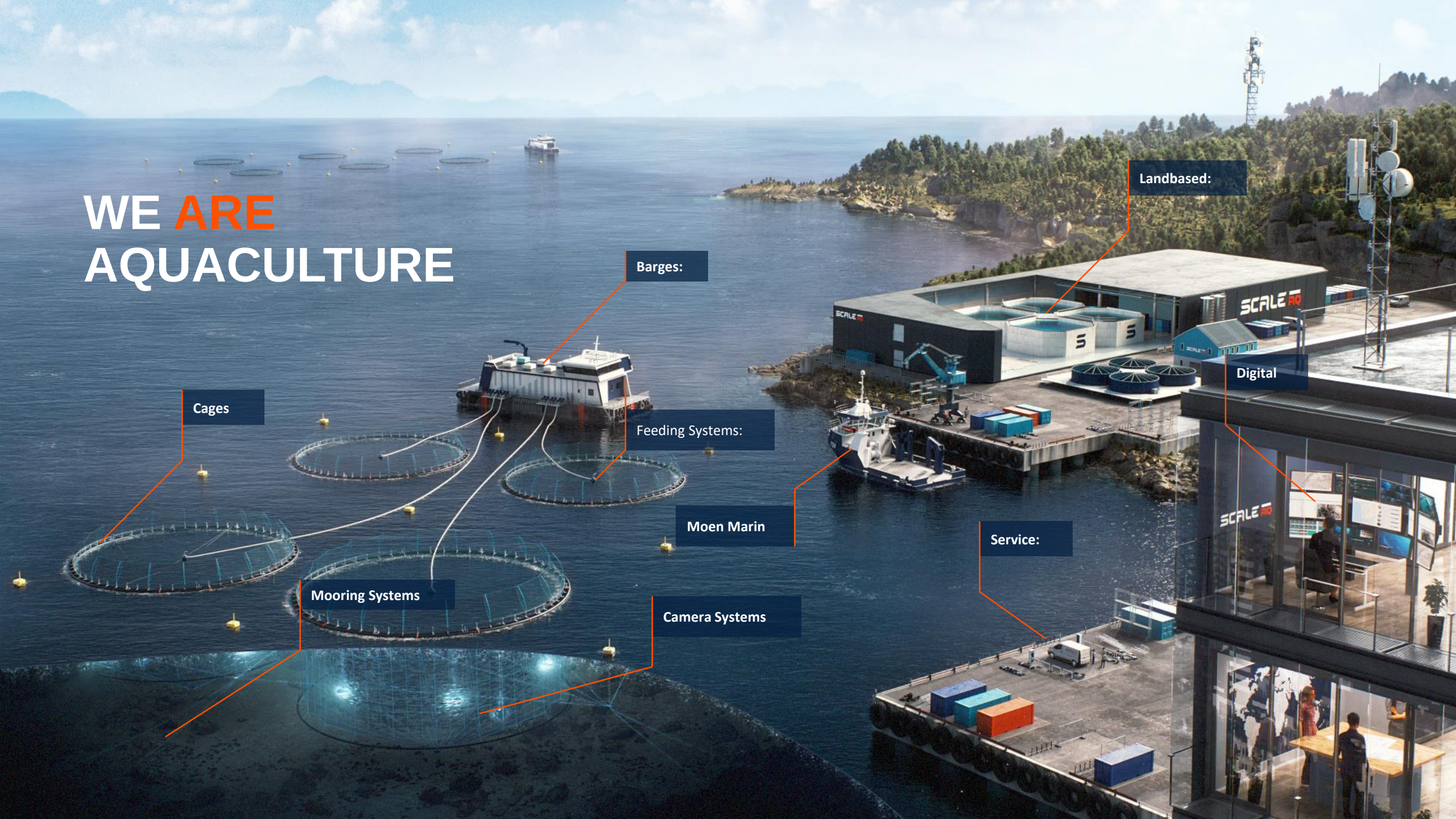
POSTSMOLT RAS → SEACAGE

«But, isn`t RAS very expensive..?»

- Initial investment is higher than Seacage and small Flow Trough systems
- But, the end profit through time is higher due to better production planning, fish welfare and mortality, low FCR etc.

- ScaleAQ can provide financing from Norway at very low interest rates

Welcome to contact us for a good discussion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