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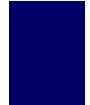
Design of land-based RAS Shrimp Farms

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Futurefish Aquaculture GmbH



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Agenda

A Why farming Shrimp in RAS

B Shrimp Farming in Germany

C System Design

D Outlook





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Why farming Shrimp landbased Recirculation Aquaculture Systems (=RAS) in Europe?

Benefits:

- Fresh “Never Frozen” Shrimp almost without competition
- Premium margins in sales
- Market size within 4 – 6 month
- USPs: regional - “clean” production
- Traceability
- Certification possible





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Why farming Shrimp landbased Recirculation Aquaculture Systems (=RAS) in Europe?

Cons:

- High Investment in Technology
- Time and Effort in Marketing – Need for Convincing
- Short Shelf-Life
- PL for Stocking only by Imports from US Hatchery





Differences in System Design Shrimp vs. Fish

- Focus on Area not Volume
- Lower Stocking Densities
 - > Improvement of Tank Area Utilization
- Minimum Handling Impact
- Lower Oxygen Consumption
- Feeding Strategy
- Cannibalism during entire Grow-out Phase





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Target Species

Pacific White Shrimp „White Tiger“ *(Litopenaeus vannamei)*





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Suitability of White Shrimp *L. vannamei* for RAS Farming in Europe

- Artificial reproduction is well controlled
- Genetical selection practiced
- Postlarvae available from SPF (= „Specific Pathogen Free“) hatcheries throughout the year
- Robust PL easy to transport over long distances
- Good growth rates
- High salinity tolerance



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Temperature Preference

28 -32C

Tolerated Salinities

0 - 40 ppt

Max. Weight

120 g

SGR

up to 3g / week



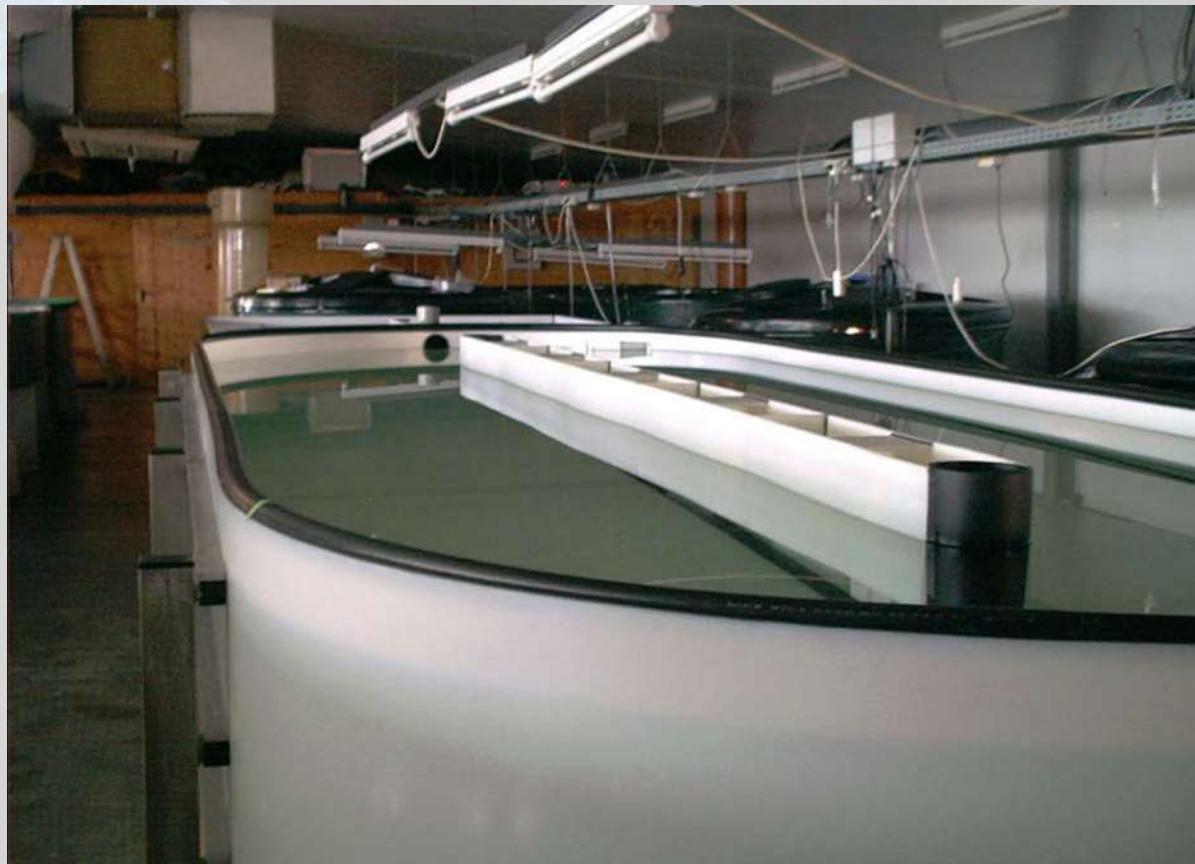
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Development of Shrimp RAS Systems in Germany

1. Experiments with “raceway” at MariFarm, Strande

2004





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Development of Shrimp RAS Systems in Germany

Pilot-scale raceway + RAS at MariFarm, Strande

2007



Still operated
by
Förde Garnelen

2009 -2014 Garnelenhof Schäfer, Affinghausen, planned production 14 to / year



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Development of Shrimp RAS Systems in Germany

2 commercial farms in Northern Germany

Garnelenfarm Grevesmühlen GmbH & Co. KG "CARA ROYAL"

Fluxx² GmbH & Co. KG

"CRISTALLE GARNELEN"

2013





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Development of Shrimp RAS Systems in Germany

30 to Farm Crustanova GmbH in Bavaria “Good Gamba”

2014/
2015

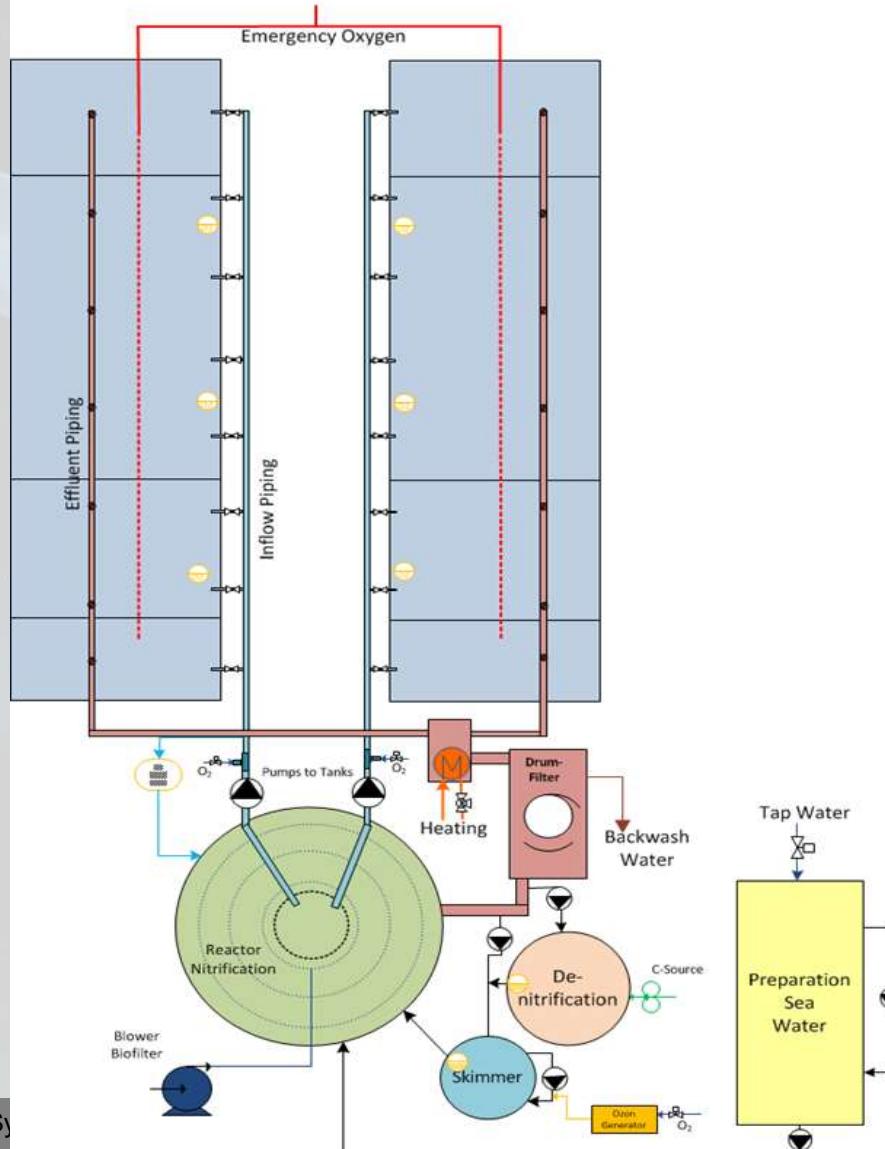




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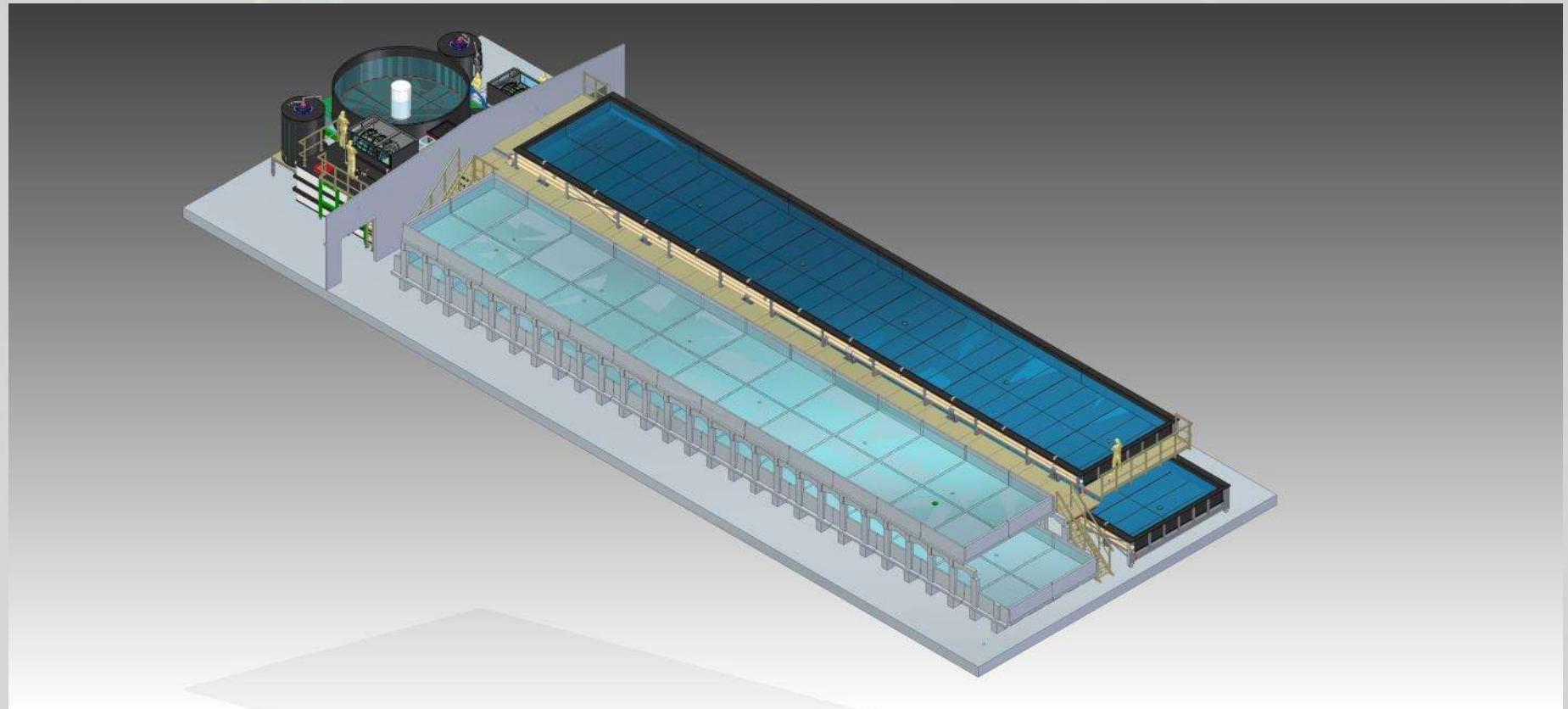


Shrimp-RAS





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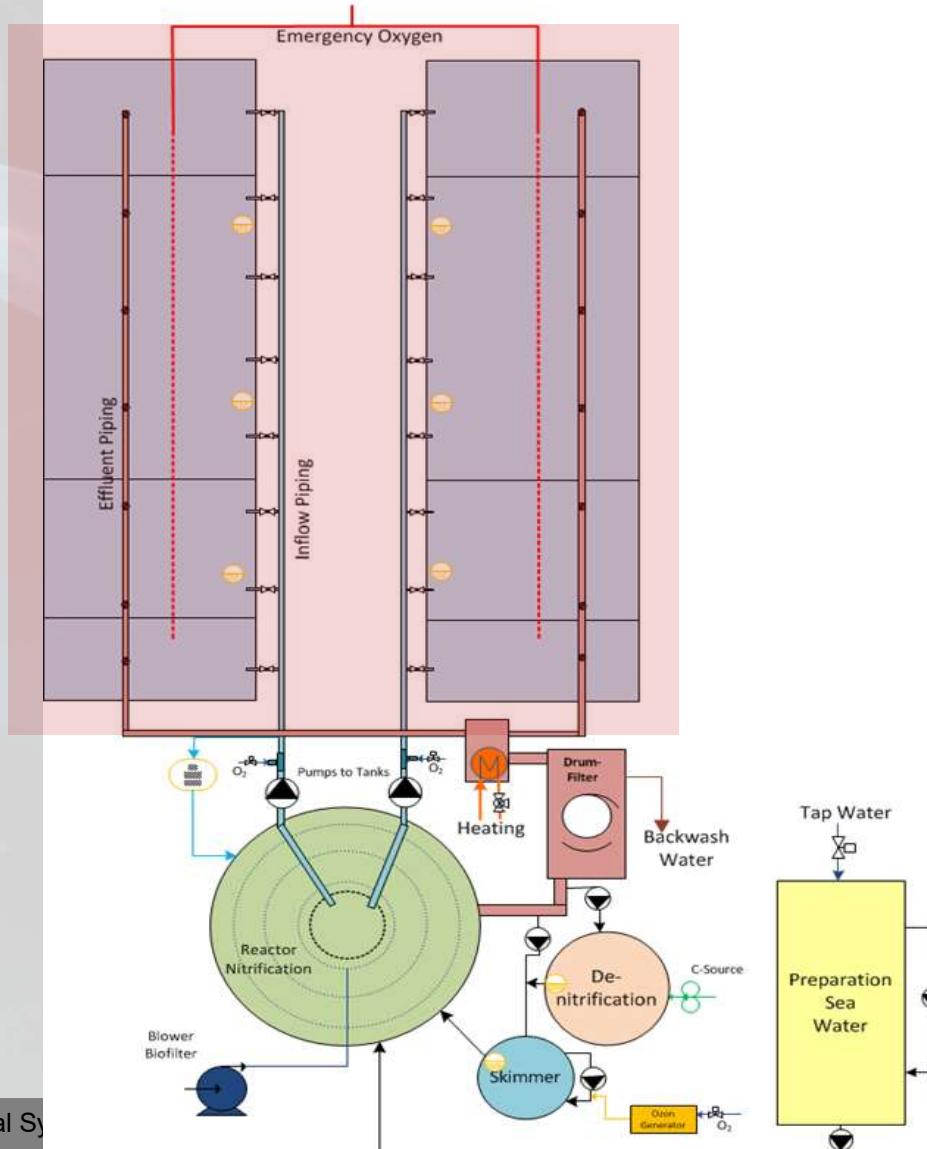


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Tanks

Shrimp-RAS





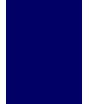
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Garnelenfarm Grevesmühlen



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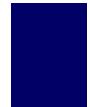
Concrete Tanks

Polyethylene (PE)



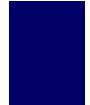


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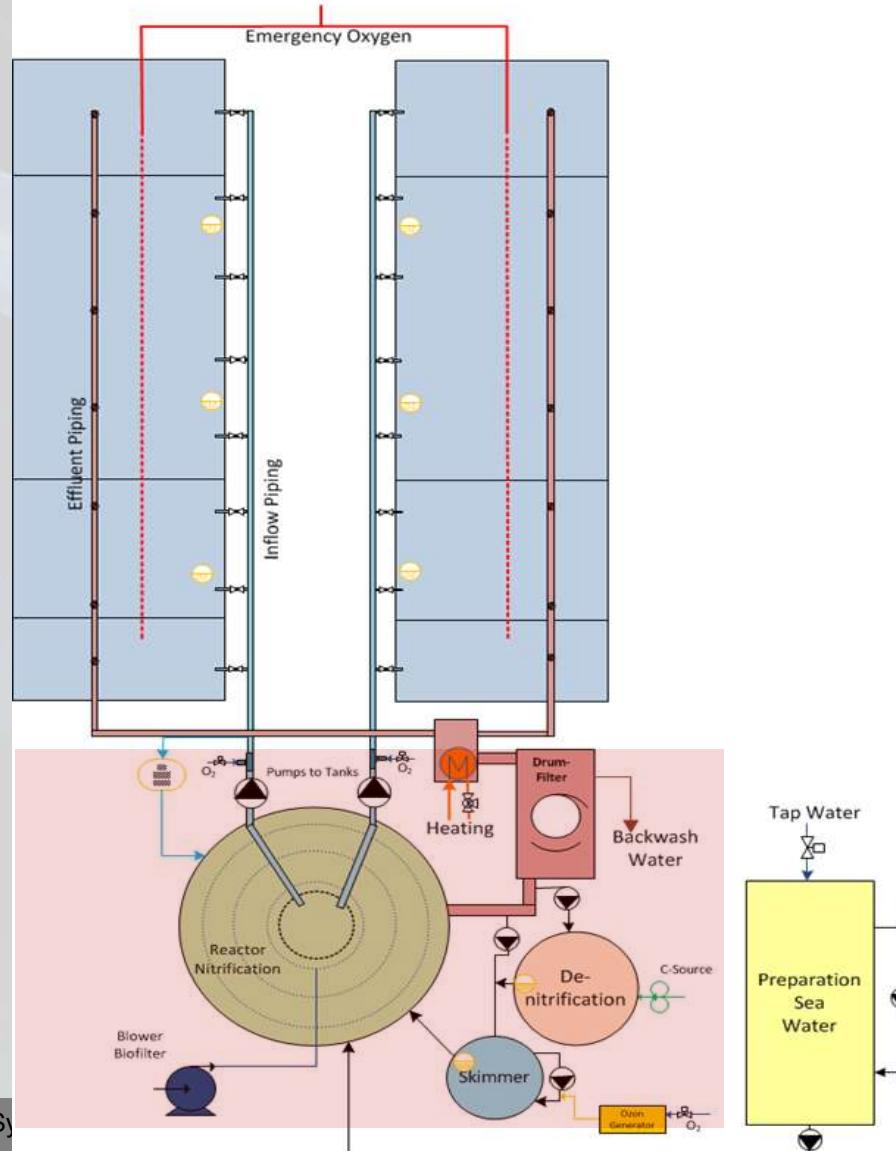


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RAS

Shrimp-RAS



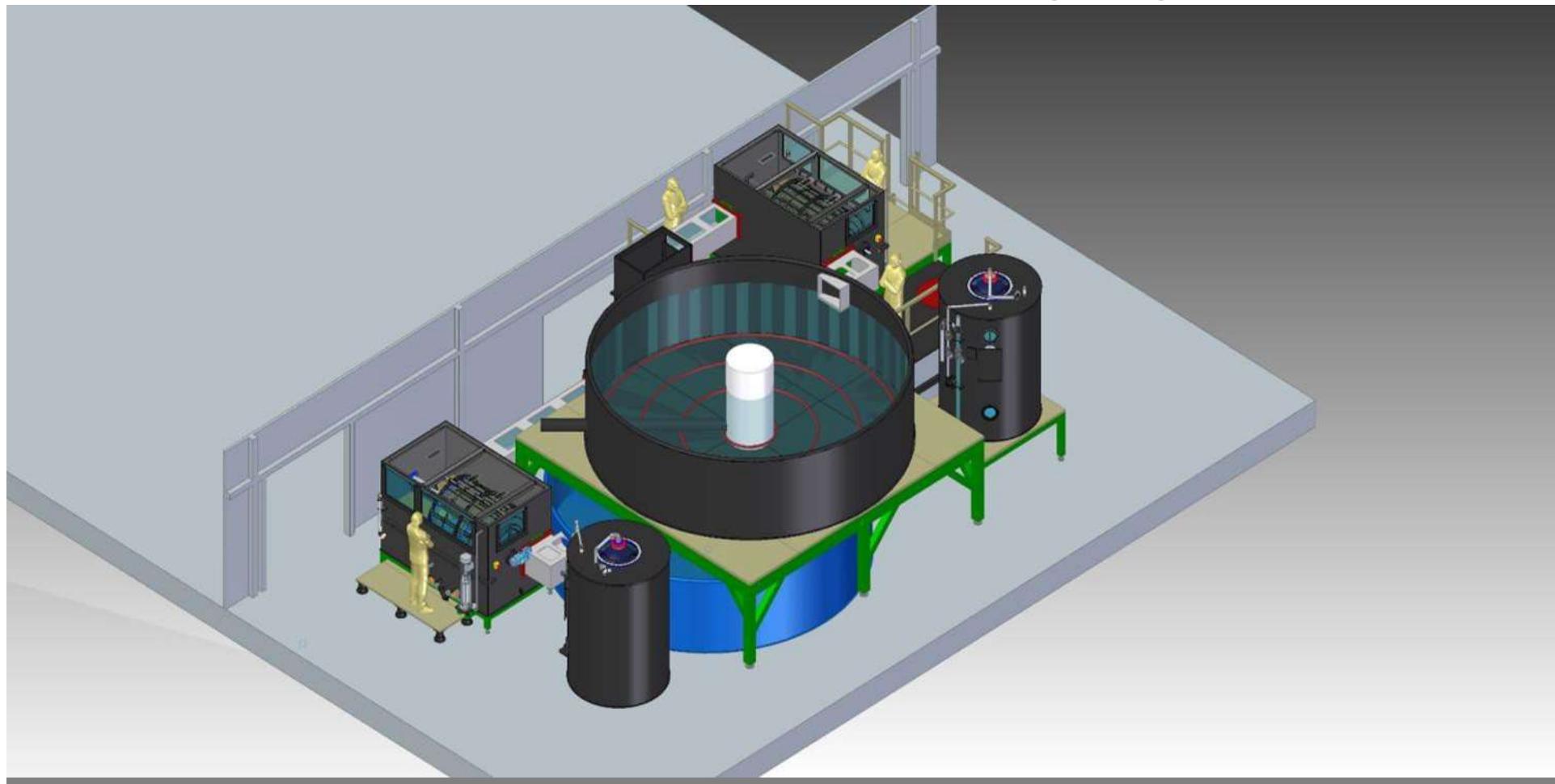


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Water Treatment System

- Classical RAS – No Biofloc
- On 2 levels like tanks to avoid pumping height





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Mechanical Cleaning – Drum Filter

All Plastic (PE)

Flow Capacity:
 $120\text{m}^3/\text{h}$

$74\ \mu\text{m}$ Nylon
Screen

Backwashing:
Process water
Tab water





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Nitrification Moving-Bed Bioreactor



32 m³ / MBBR
50% Carrier

Spec. Surface
approx. 700m²/m³



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Denitrification Moving-Bed Bioreactor

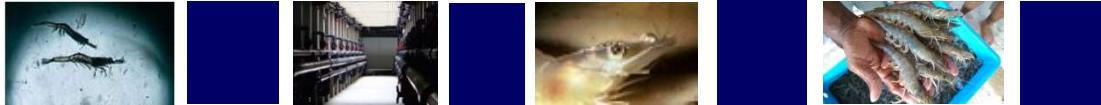
4 m³ Carrier
Periodic mixing with
internal gasphase

Dosing of Methanol or
other Carbon Sources
according to pH and ORP





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Protein Skimmer

Flow rate 50 m³/h
= 30% of tank flow

2 g Ozone / Skimmer

Goal: ORP > 250 mV





Pumps Oxygenation

Tank Flow
1 Exchange / hour

Low Head Oxygenation
at 0,6 to 0,8 bar

280% outlet saturation

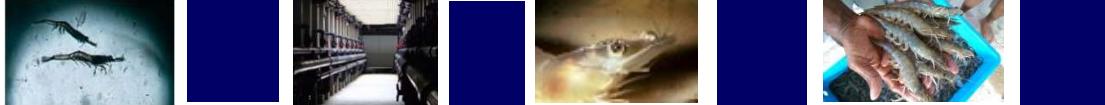
2 level O2 control

12 kWh/kg shrimp





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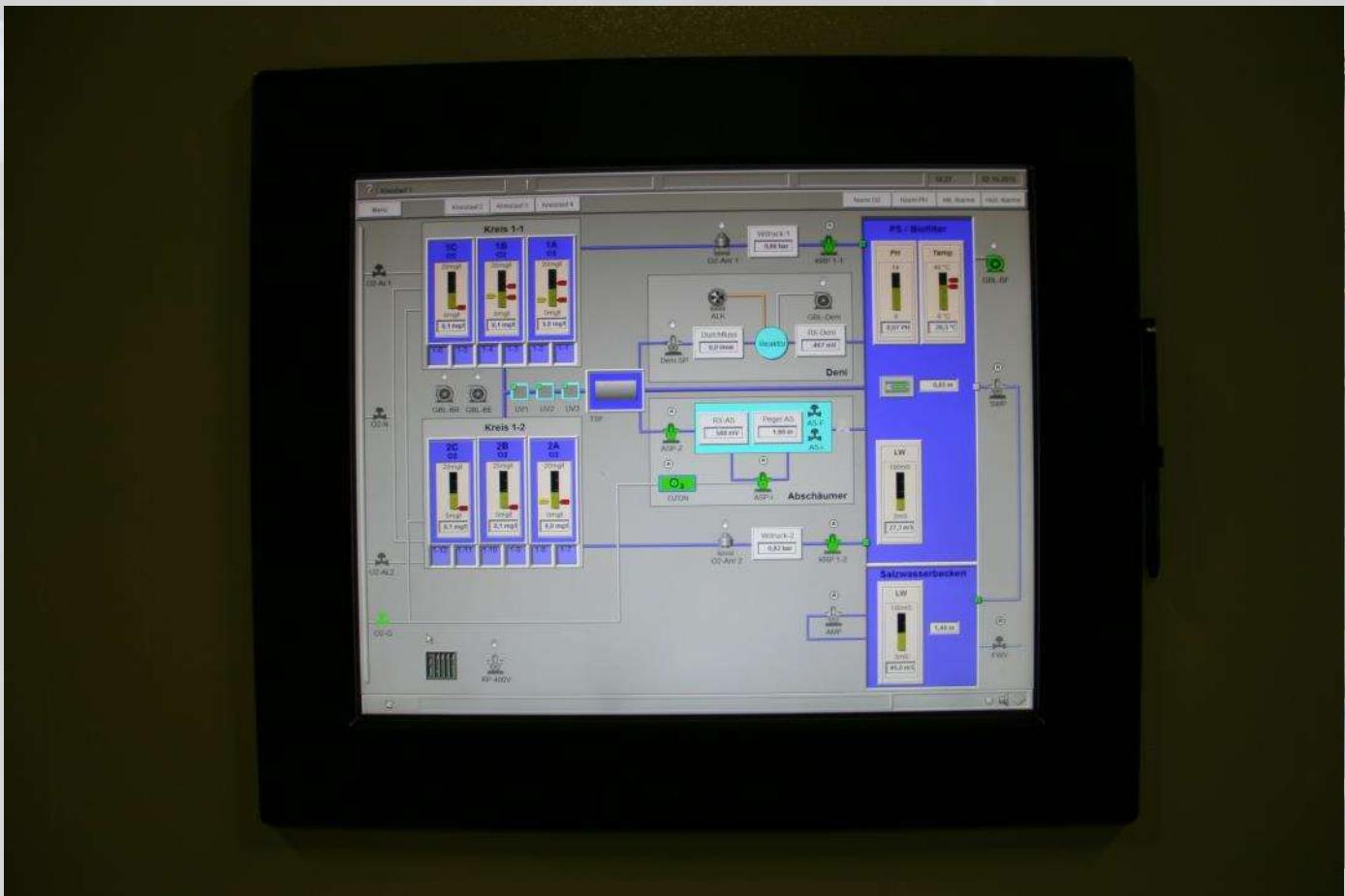
Control System

PLC Controlled

Remote Service

Trends

Alarms

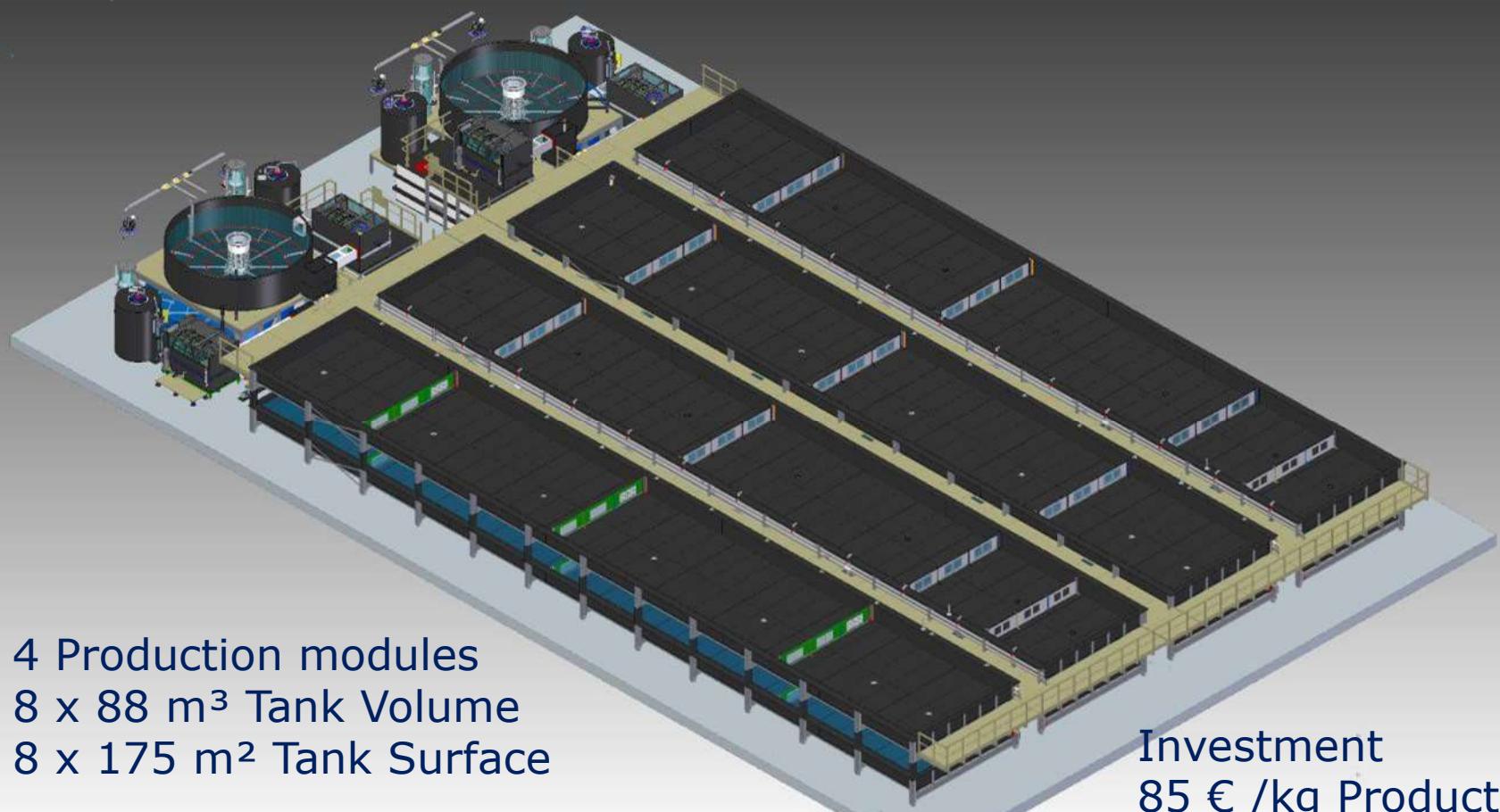




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Crustanova GmbH



4 Production modules
8 x 88 m³ Tank Volume
8 x 175 m² Tank Surface

Investment
85 € /kg Production



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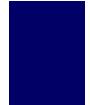
2014

3-Tier Pilot-System Fish / Shrimps Apollo Aquaculture, Singapore





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Outlook

Establishing a European Hatchery



Kuruma-Shrimp
„Kuruma Ebi“
(Marsupenaeus japonicus)



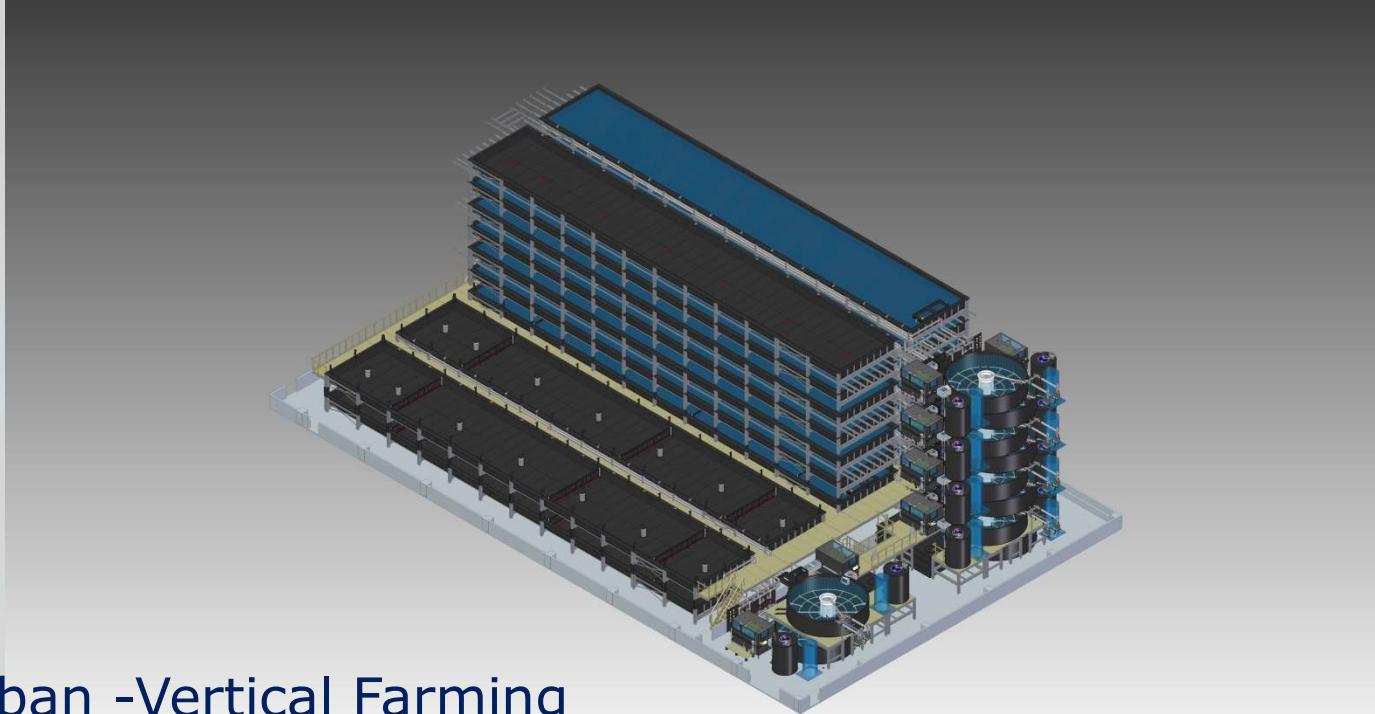
Alternative Species?



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Feeding in RAS Systems



Urban -Vertical Farming



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Thank You for Your Attention

- happy shrimpin' -



**Friends don't
let friends
eat imported
shrimp**