

LET'S IMPROVE TOGETHER



royal brinkman

global specialist in horticulture

Moleaer water treatment

MOLEAER<sup>®</sup>

ADVANCING NANOBUBBLE TECHNOLOGY

Let's  
improve  
together.







HELLO, I AM

René Mondt

Technical Specialist





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# Royal Brinkman Technologies

We execute



World wide

tailor made  
sustainable solutions





# Royal Brinkman Technologies





# Water related challenges

## Water availability

## Water quality

- Algae and sediment/pollution
- Pathogen control
- Uniformity
- Parameters such as dissolvable oxygen (DO)
- **Chemical usage and footprint related topics**

## Re-use of water and fertilisers

## Triggers

- Climate / water scarcity
- Regulations
- Sustainability
- Cost savings, water, and fertiliser reusage

## Risks

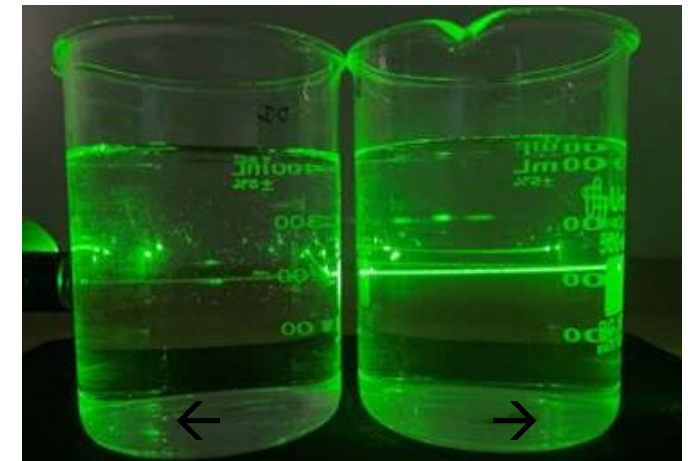
- Sediment/pollution
- Sodium build up
- Spreading water-borne plant diseases



# Moleaer water treatment

# Moleaer vs. aeration

- ☞ Gas shear-off method, patented
- ☞ Gas transfer rate (OTE) 85%
- ☞ Dissolves oxygen in water in 2 forms :
  - Dissolved oxygen (diffuse oxygen)
  - Negatively charged gas-particles in suspension
- ☞ Oxygen buffer
- ☞ 200+ field installations in NW-europe



← Untreated water → Treated water




# Technical application




 Ambient air reservoir pre-treatment



 Oxygen tank pre-treatment

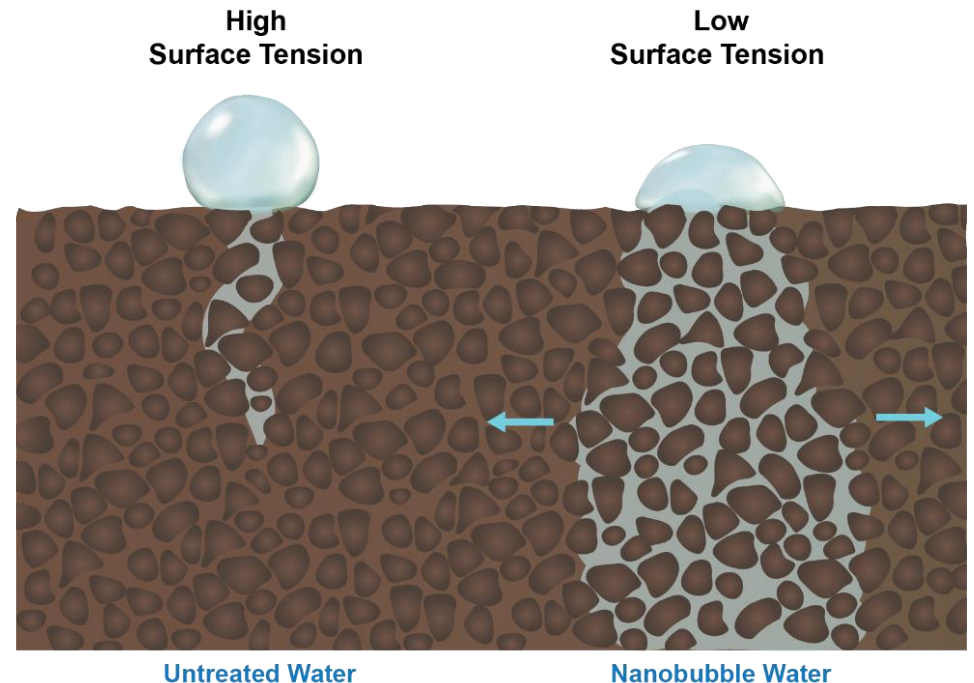
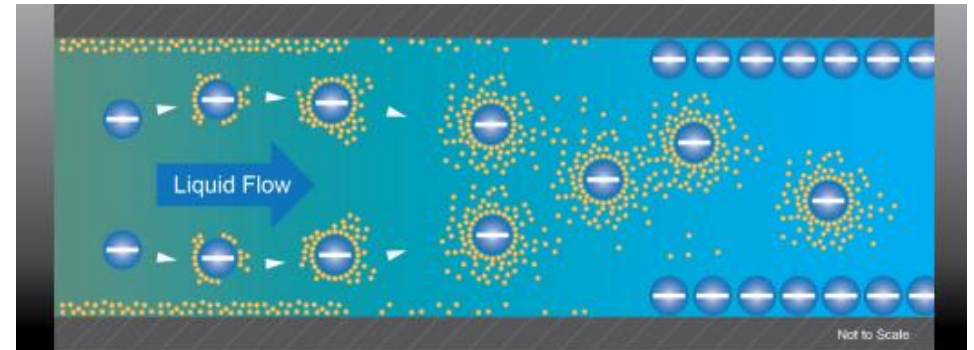


 In-line and custom setups



## How nanobubbles work in irrigation water vs. diffused-oxygen

- 🔗 Oxygen stabilisation
- 🔗 Lowers water surface tension
- 🔗 Negative charge and scouring
  
- 🔗 Stimulates substrate microbiology
- 🔗 Stimulates rhizosphere oxygenation
  
- 🔗 Chemical-free oxidation
- 🔗 Water quality improvement





# Reservoir treatment

## *Ambient air injection*



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# Reservoir treatment

## Ambient air injection

- gb Importance of clean reservoirs (*lined*)
  - Presence of organic carbon, results in:
    - Growth medium for bacteria/fungi
    - Increases pathogens in water
    - Stimulates algae-bloom
      - Lifts pH (and DO-value)
  - Nutrient source
  - Covering vs. Moleaer-treatment







Resultat	Pilze	Resultate	1	2	3	4	5	6
	Botrytis spp.	1						
	Botrytis cinerea	1						
	Phytophthora spp.	2						
	Pythium spp.	6						
	Pythium aphanidermatum	1						

Detektiert: 1 = sehr leicht, 2 = leicht, 3 = schwach, 4 = mittelmäßig, 5 = stark, 6 = sehr stark



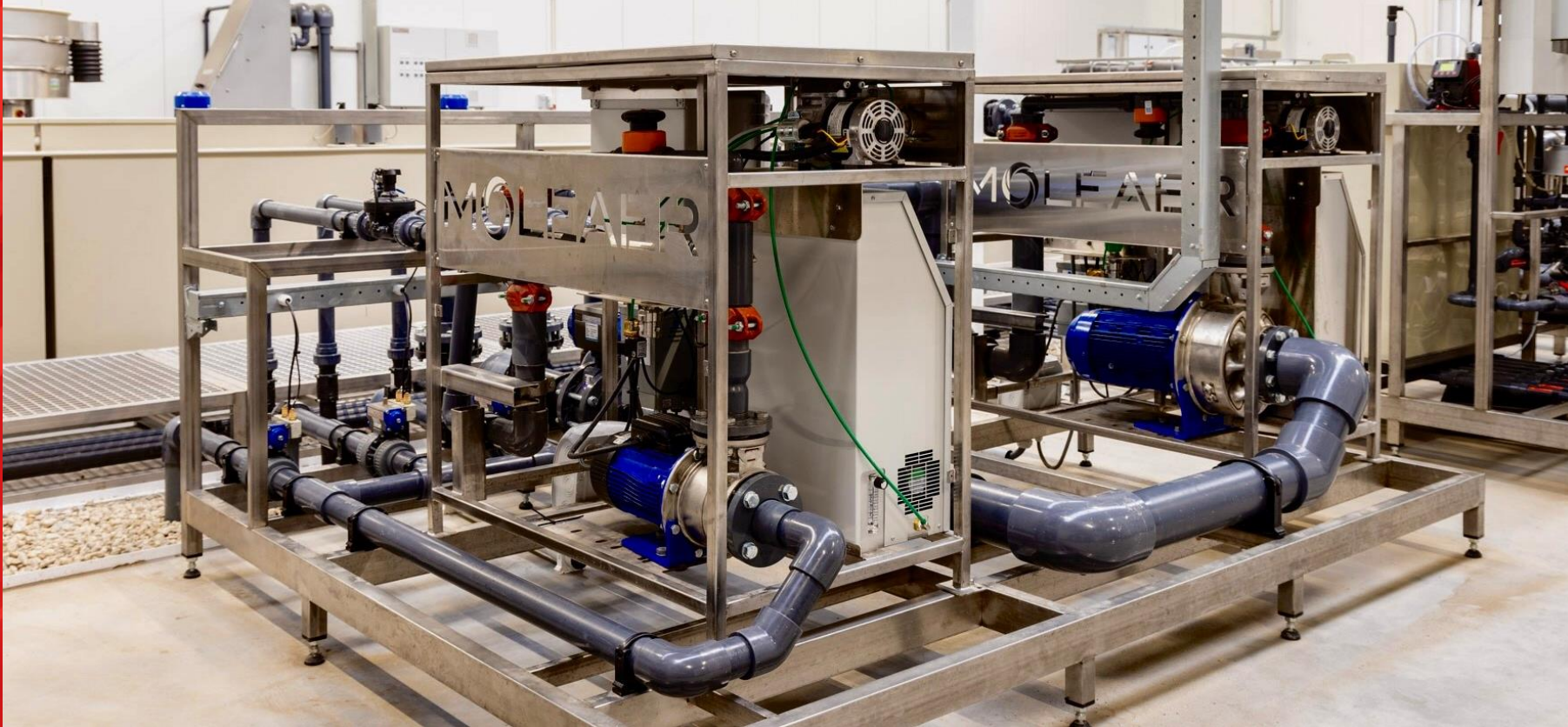
## Chemical-free water improvement

-  Formation of reactive oxygen species (ROS)
-  Gas distribution in water
-  Attraction to hydrophobic substances
-  Aerobic digestion





# Irrigation water treatment *purified oxygen injection (onboard produced)*



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## Importance of oxygen in crops

- 🏠 Substrate composition
- 🏠 Oxygen is absorbed by roots
  - Cellular respiration
  - ATP production
    - Growth and root development
    - Energy for processes as fertiliser consumption
- 🏠 Relation with heat- and stress tolerance
- 🏠 Impairs formation of water-borne diseases in water



# Findings irrigation water treatment

*purified oxygen injection (onboard produced)*

## Key benefits

- Improved nutrient uptake, substrate structure and wettability
- Healthier roots and higher density and lower pathogens
- Cleaner irrigation rigs, scouring of biofilm
- Stimulates microbiology
- High O<sub>2</sub> saturation impairs spore formation of Phytophthora in water, like *P. cryptogea*

## 3rd party validation

 NovaCropControl

 WAGENINGEN  
UNIVERSITY & RESEARCH

 proefstation  
VOOR DE GROENTETEELT

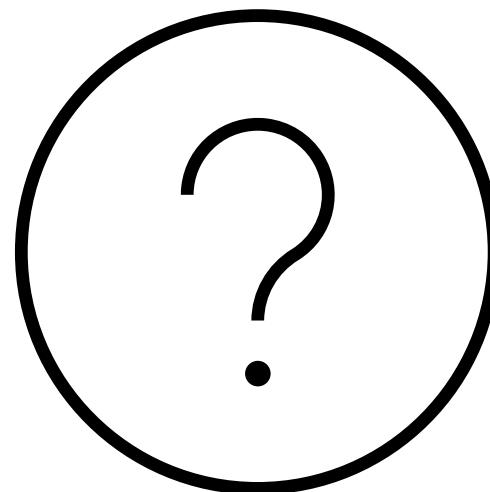
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Società Benefit  
SCIENCE IMPROVING AGRICULTURE







**Contact:**

René Mondt

+316 – 28 18 17 92

[rene.mondt@royalbrinkman.com](mailto:rene.mondt@royalbrinkman.com)