

Industrial microalgae production

The ProviAPT way



Proviron -
The company
behind the algae

Proviron
Microalgae
Products

The
ProviAPT
concept

The
ProviAPT
platform -
Contract research
& manufacturing



Mission

Provide chemical solutions for tomorrow's problems



Markets

**History of
Proviron**

Location



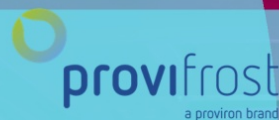
- Stabilizers for waterbased dispersions
- Pharmaceutical intermediates
- Biobased solvents and plasticizers
- Applications: feed, food and healthcare up to and including plasticized polymers and high VO solvent substitutes



- Niche plasticizers, both in volume and application
- Mostly non-PVC applications
- Non-phthalate
- Partly or 100% bio-based
- Applications: food packaging, fabrics, medical instruments, high-tech car components, kids' toys, ...



- Anti-Microbial & Anti-Inflammatory properties
- Helps to decrease the use of antibiotics in animal feed
- Applications: broiler, turkey, poultry, shrimps, fish, cows & piglets



- Snow & ice control
- Environmental friendly (nitrogen free)
- Aircraft and runway de-/anti-icing fluids
- Liquid and granulate

Toll manufacturing



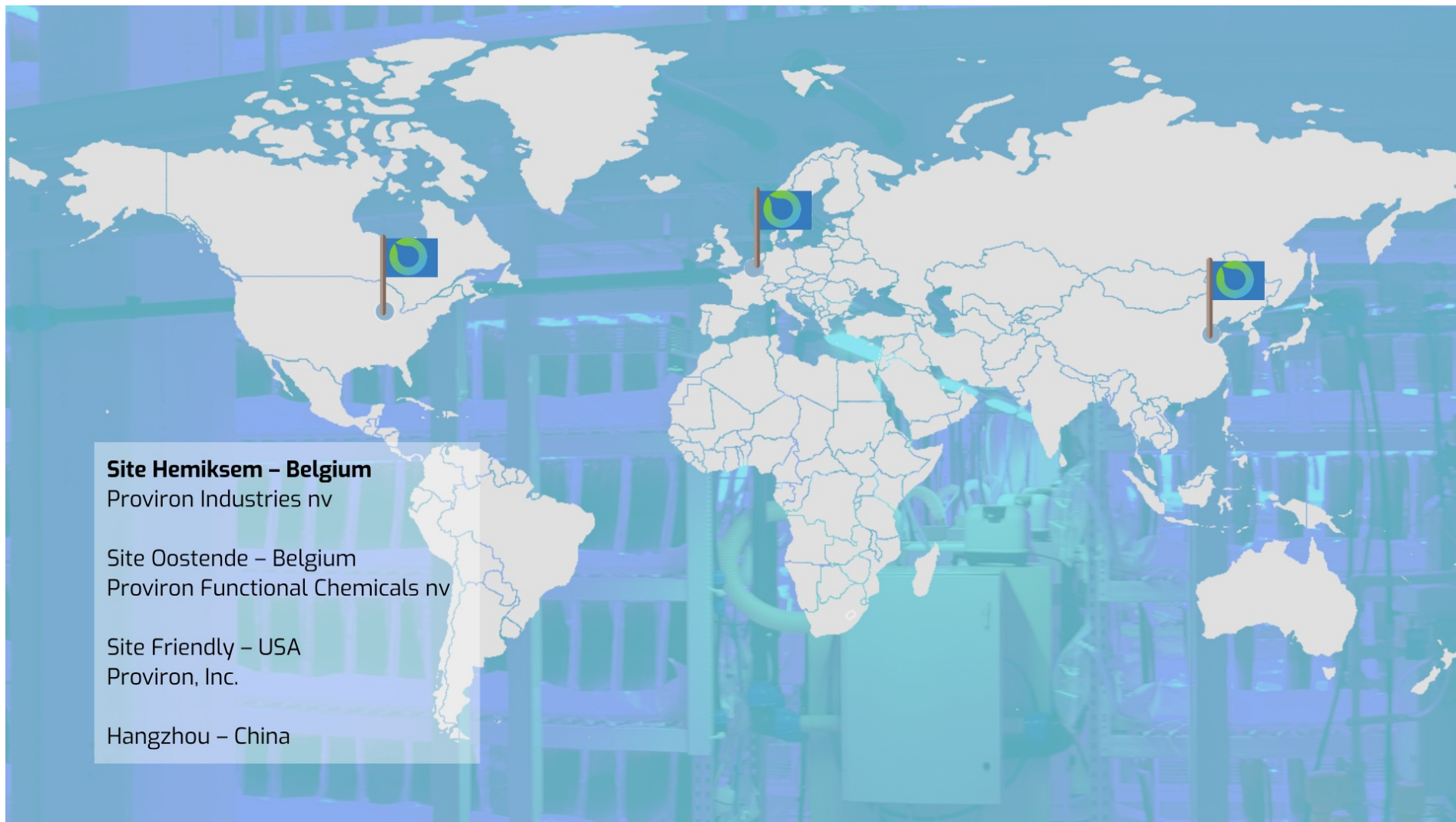
- Polyurethane Systems
- Brake Fluids
- Sulphur-based Chemistry



- Heat Transfer Fluids
 - Organic Acid Technology inhibitors
 - Highly advanced reserve alkalinity booster
 - Proviflow N
 - Proviflow L (food approved)
- Applications:
 - HVAC
 - Industry (breweries, dairies,...)
 - Leisure (ice skating ring,...)

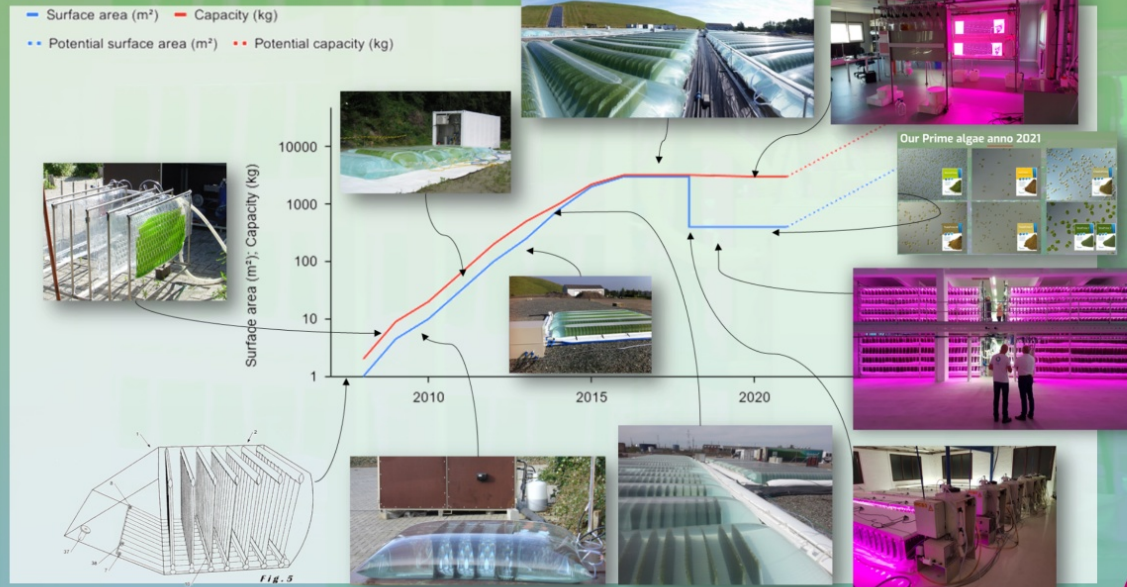
From a traditional chemical producer to a developer of renewables based solutions

- **1977**
Proviron Engineering (Hemiksem)
- **1983**
Proviron Industries (Hemiksem)
- **1996**
Proviron Fine Chemicals (Oostende)
Proviron Inc. (Friendly, WV, USA)
- **2000**
Sulphur Silanes derivatives (O)
- **2006**
 - Biodiesel unit (O)
- **2009**
Innovations – Microalgae (H)
- **2011**
Pu Wei Lun (Hangzhou, China)
- **2014**
ADF in Provifrost portfolio (O)
Animal Health (H)
- **2016**
70 M €, 230 employees
Divestment Proviron Basic Chemicals (O)



The **ProviAPT** concept

Proviron Advanced **Photobioreactor** Technology



The
concept

Mode of
action

From
concept to
indoor
plant

ProviAPT principles & advantages

- **Indoor closed PBR:** 100% (recyclable) feed grade plastic film material
- High aerial productivities: **Vertical** farming
- Modular concept: **Flexibility**
- **Automated** reactor production and **real time** monitoring (Flows, CO₂ usage, Productivity, Photosynthetic efficiency, culture health)
- **Reduced contamination risk**
- **Species specific parameterisation** of growth conditions in function of increased yield, compounds
- **High cell densities**
- Reduced pressure drops, low shear stress – **sensitive species**
- **Reliable year round** supply of microalgae with high and invariable quality

ProviAPT mode of action

Closed photobioreactor system

- Filtered air (+ reduced intake by recirculation)
- Filtered nutrients
- No pathogen reservoirs in vicinity
- Computer steered- minimal hands-on work
- Reduced contamination risk

GMP certified (Feed Chain Alliance)

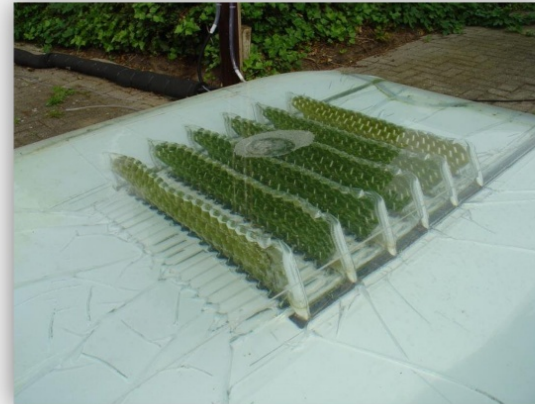
- Feed/food grade nutrients
- Traceability
- No pesticides, no heavy metals
- FCA certificaat BE 01/1522.GF

Real time monitoring

- Flows, CO2 usage
- Productivity
- Photosynthetic efficiency
- Follow up culture health



2009



Chaetoceros muelleri



Phaeodactylum tricornutum



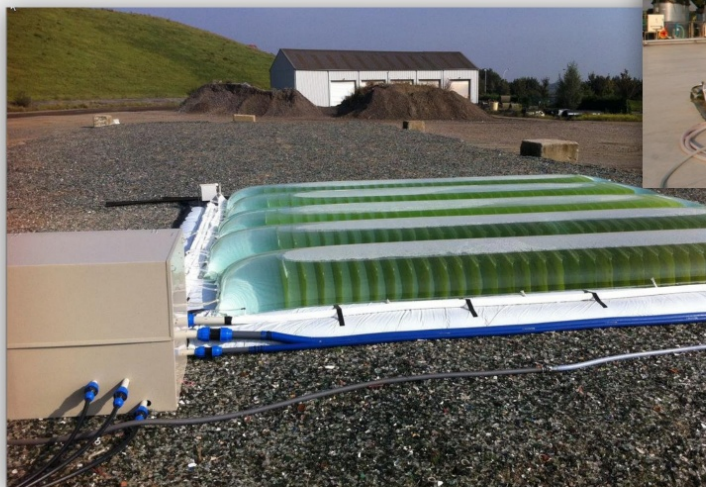
Nannochloropsis oculata



Isochrysis aff. galbana

ALPO closing event | 19/01/2021

2011



ALPO closing event | 19/01/2021

2012



ALPO closing event | 19/01/2021

2013



ALPO closing event | 19/01/2021

2014



ALPO closing event | 19/01/2021

2015



240 reactors



ALPO closing event | 19/01/2021

2016



ALPO closing event | 19/01/2021

2017 switch to indoor

- Reliable year round supply of microalgae with high and invariable quality
- Species specific parametrisation of growth conditions in function of increased yield, compounds
- Even better control of contamination
- Flexibility

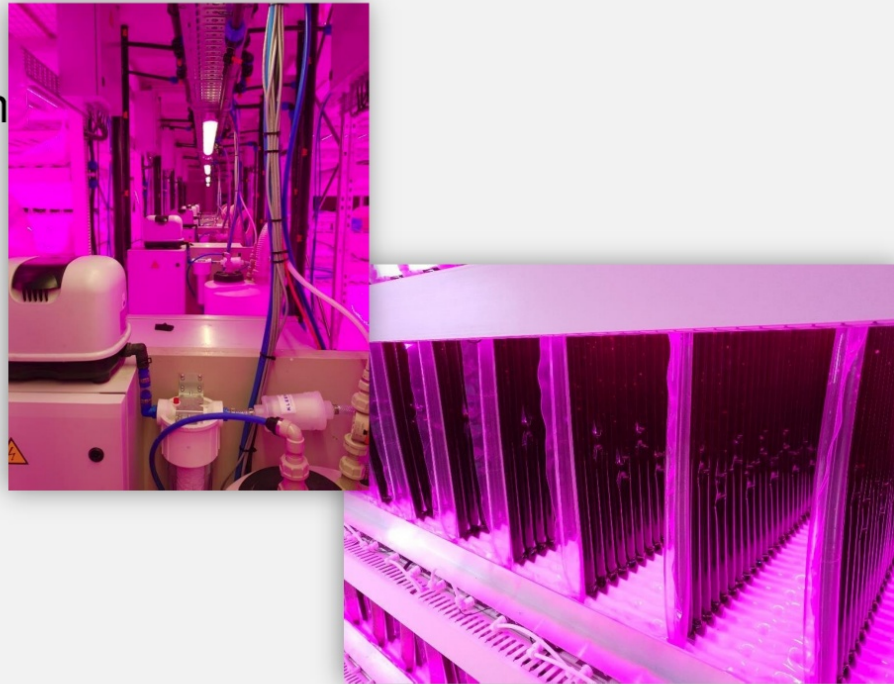
Indoor pilot testing





2018

- 6 units –16 reactors each
- 3360 m² reactor surface
- Scalable
- room for 11 batteries of 6 units



ALPO closing event | 19/01/2021

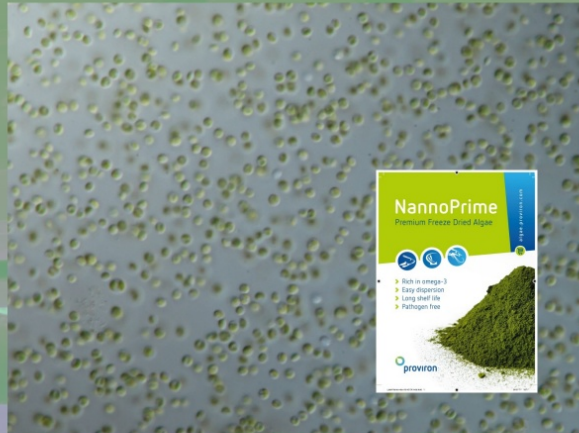


2018 'usual suspects'

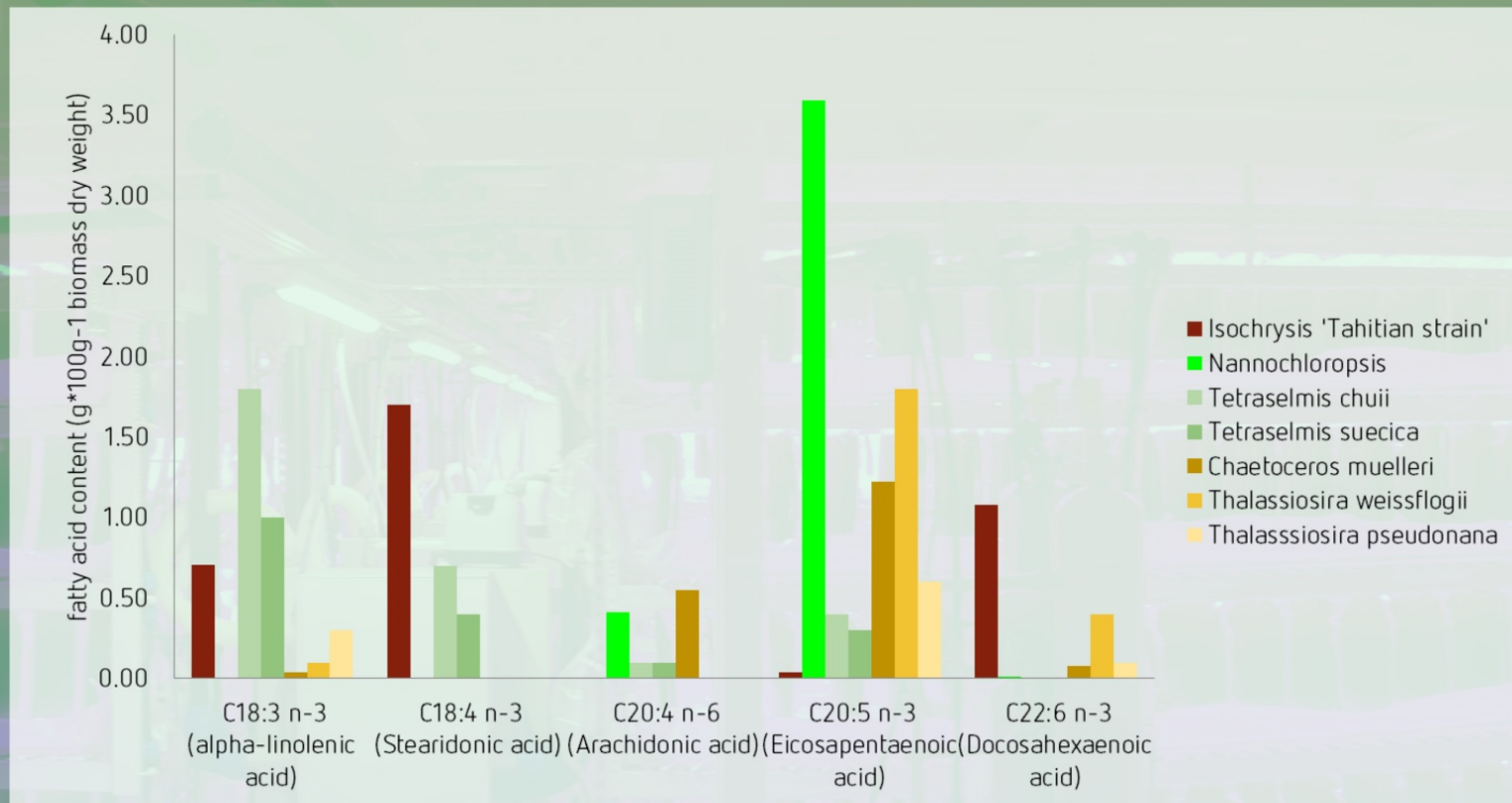


ALPO closing event | 19/01/2021

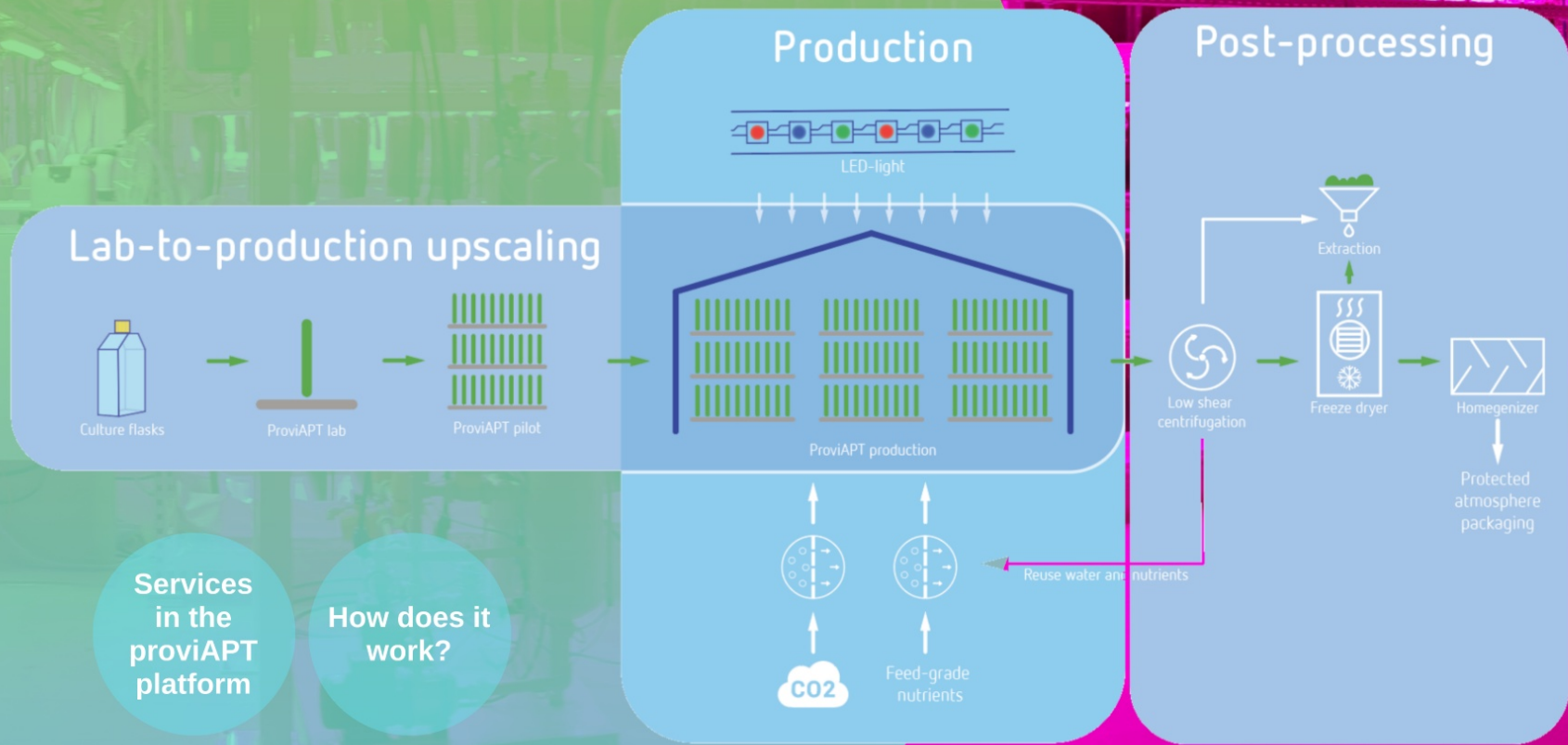
Our Prime algae anno 2021



Excellent fatty acid profile



Contract manufacturing



Services
in the
proviAPT
platform

How does it
work?

Contract manufacturing & research

- Starting up in 2021
- Pick your strain and take advantage of our fully automatized production process
- Lab scale production (± 50 g per week) & research
- Scale up to
 - pilot scale (± 1 kg per week)
 - production scale (several tons per year)
- Optimize post-processing
 - Low shear centrifugation
 - Spray drying, freeze drying
 - Extraction
 - Protected atmosphere packaging

Why? What do our customers gain?

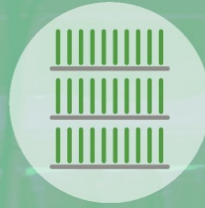
- Profit from our **extended expertise** in microalgae cultivation
- **Upscale** to production volumes within a month
- Reduce labor, **gain time** and get to the market faster
- **Avoid culture crashes** and contaminated batches
- Increase productivity of mass cultures by means of our innovative **ProviAPT system**
- **Save the space** needed for algae mass cultivation in regular systems
- Optimize your product with **real-time feedback**

ProviAPT Lab



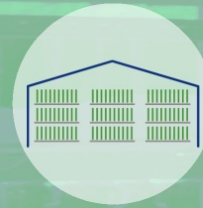
- Volume: 6.4 Liters (1 panel)
- High productivities up to 1.5 g/L/d
- Cell densities between 2 and 3 g/L
- Batch or semi-continuous operation
- Autoclavable tubing and filters
- 0.2µm air and media filters
- Automated operation and nutrient addition
- Automated medium recipe building from up to 20 component tanks, with auto pH tuning
- White, red, blue and far red LED lights up to 1000 µmol/m²/s
- Real time control and monitoring of CO₂ levels, temperature, light conditions, air pressure, flows, growth, light efficiency, RGB culture color,...

ProviAPT Pilot



- Volume: 210 Liters (35 panels)
- Highly productive up to 1.5 g/L/d
- Typical cell densities between 2 and 3 g/L
- Batch or semi-continuous operation
- Autoclavable tubing and filters
- 0.2µm air and media filters
- Automated operation and nutrient addition
- Automated medium recipe building from up to 20 component tanks, with auto pH tuning
- Real time control and monitoring of CO₂ levels, temperature, light conditions, air pressure, flows, growth, light efficiency,...

ProviAPT Production



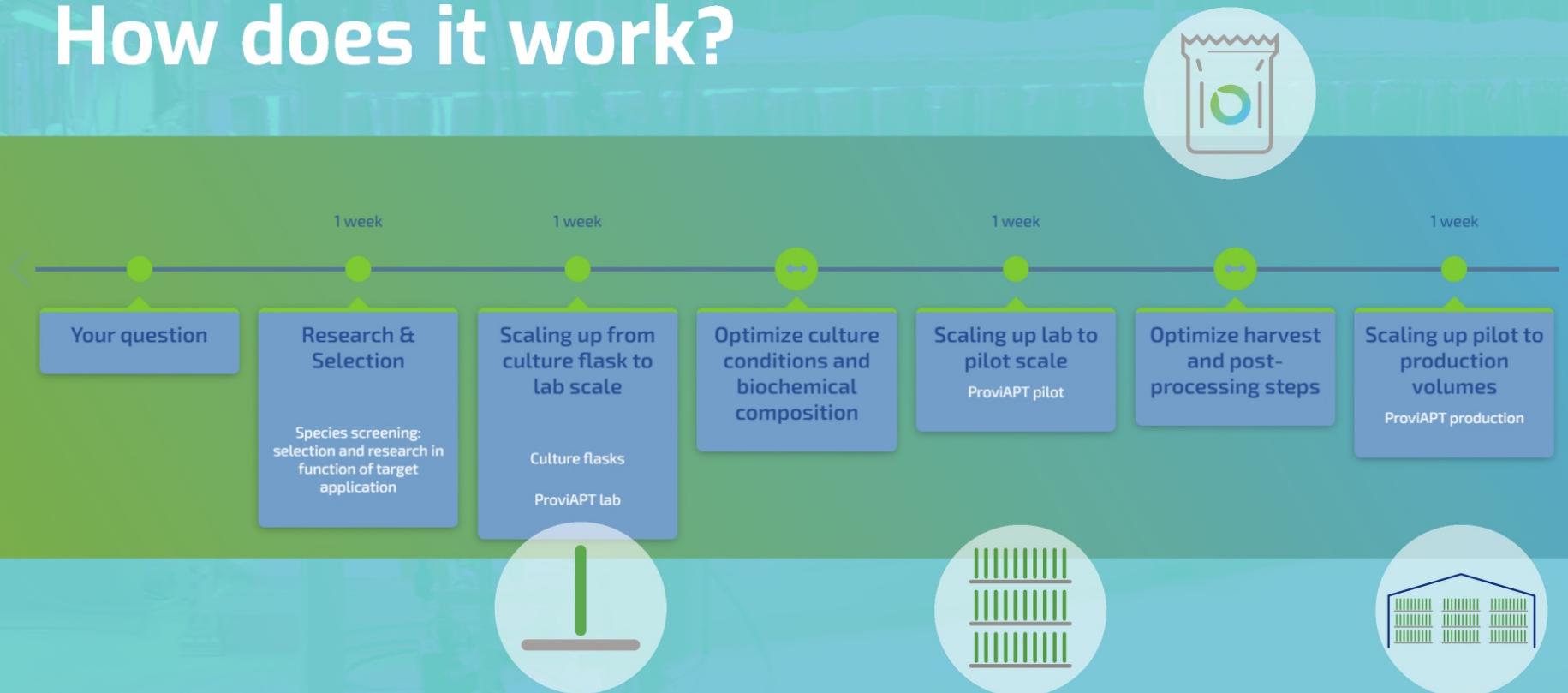
- Capacity: 1 battery composed of 6 units or 3360 m² reactor surface
- Room for 11 batteries of 6 units
- Highly productive up to 1.5 g/L/d
- Typical cell densities around 2 g/L
- Autoclavable tubing and filters
- 0.2µm air and media filters
- Automated operation and nutrient addition
- Automated medium recipe building from up to 20 component tanks, with auto pH tuning
- Real time control and monitoring of CO₂ levels, temperature, light conditions, air pressure, flows, growth, light efficiency,...



Post-processing

- Low shear centrifugation
- Normal centrifuges
- Spray drying
- Freeze drying
- Chemical extraction
- Protected atmosphere packaging

How does it work?





Thanks for having us!

algae.proviron.com

Coming soon: ProviAPT platform website!!

We are always looking for interesting collaborations!

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Upcoming **PhD position** on
data mining as support of PBR
microalgae production
www.digitalgaesation.eu

Industrial microalgae production

The ProviAPT way



Proviron -
The company
behind the algae

Proviron
Microalgae
Products

The
ProviAPT
concept

The
ProviAPT
platform -
Contract research
& manufacturing

