

ecoduna



Overview

- Intro
- Building a 1ha industrial pilot plant
- The harvesting system
- 365 days – data and experiences
- Product development
- Outlook



ecoduna/eparella facilities



- 500m² R&D Demo plant
 - 40l-4500l PBRs -> 30m³



- 1ha industrial pilot 2018





USP

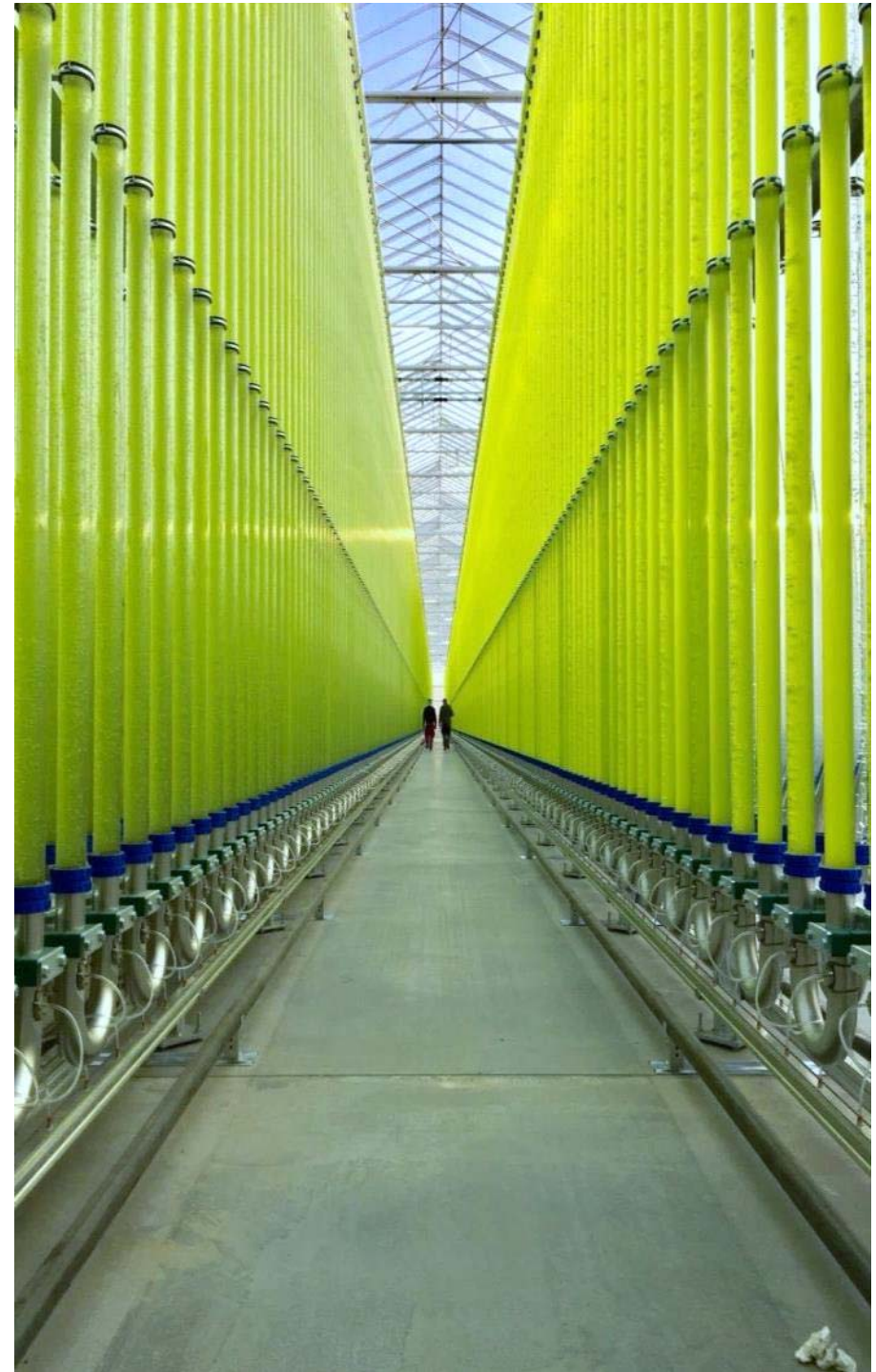
Proprietary technology

- **Upright flowing algae**
- **Glass & Steel (food safe)**
- **No cell stress by pumps**
- **6m high**
- **230km glass tubes in 32 units**
- **Fully automated**
- **100t of dry biomass p.a.**

▪ <https://www.youtube.com/channel/UC3Ko941azX0b58-hNOMK6DA>

Low OPEX – fully automated

- Optimal growth due to:
 - No Oxygen ,poisoning‘
 - No CO₂ depletion
 - Good Light penetration
 - Good Culture stability
 - Reduced Biofilm
- Continuous harvesting by cell density
- Water recycling
- Cleaning in place – no mechanical cleaning
- Closed system – controlled culture quality





Process chain @ ecoduna



Lab
Seed & culture
collection



**Inokulum
production**



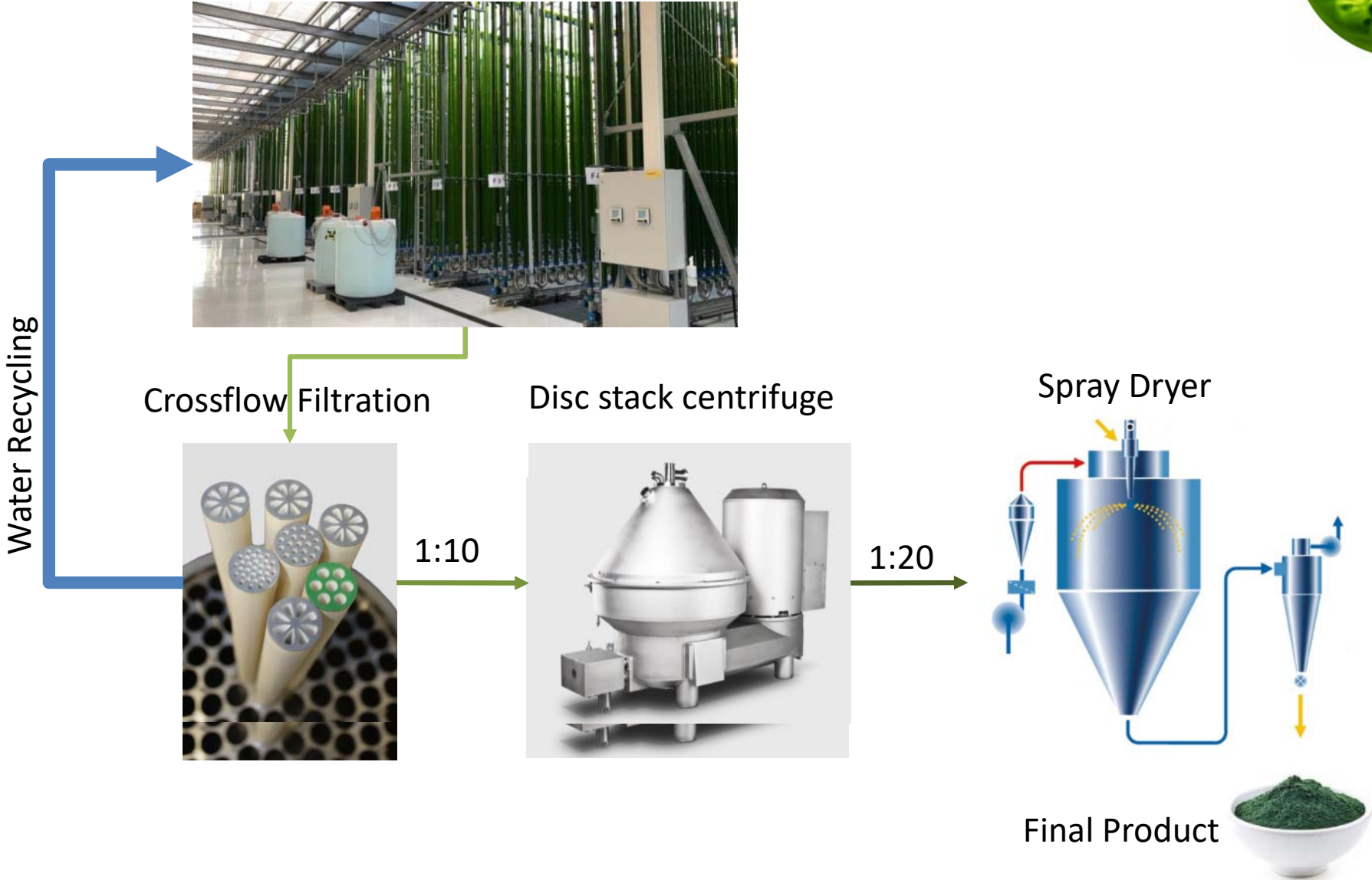
**Algae
Production**



Daily harvest



Harvesting Process



Technical Data



- 1ha plant
- 32 independent growth vessels
- 800 m³ photoactive volume
- 43.000 glass tubes (6cm diameter, 6m height)
- 230 km pipe length
- Up to 80% Water recycling
- Fixation of 2 kg CO₂ for 1 kg algae biomass, up to 5kg in total
- Air consumption: up to 2.700 Nm³/h
- Amount of Valves/sensors: 1.200
- Dry biomass 50-300kg/day (seasonal)

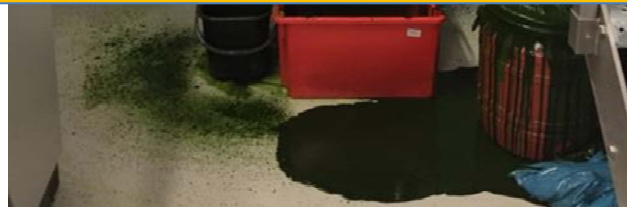
One year of industrial pilot - PBR



One year of industrial pilot - Downstream



One year of industrial pilot - Drying



First products

- Fresh
- Fresh/Frozen
- Powder
- Capsules/Tablets
- Extracts
 - EPA

ecoduna
plus



Spirulina & chlorella mix tablets
120 pcs / 240 pcs



Market entry



Product variants

<https://www.ecoduna.com/shop/>

<p>Chlorella powder 80g / 150g</p>	<p>Chlorella capsules 120 pcs / 240 pcs</p>
	
<p>Chlorella tablets 120 pcs / 240 pcs</p>	<p>Spirulina & chlorella mix tablets 120 pcs / 240 pcs</p>
	



Grüne Woche

11. bis 17. März 19

7 Tage Grüne Preise

·10% Rabatt auf Ihren gesamten Einkauf bei ecoduna

7 Tage Grünes Glück

Täglich verlosen wir ein Algengenusspaket auf unserer Facebook Seite

7 Tage Grüner Genuss

Entdecken Sie Algenkreationen auch bei unseren Partnern aus der Region:

- Krupbauer's Backhaus Algenbrot
- TARO American Bar Algendrink
- Der Gselchte Schmackhaftes mit Algen
- Konditorei Petznek Algeneis
- Landgasthof Haslauerhof Exquisites verfeinert mit Algen

St. Patricks Day Konzert
16. März, ab 20 Uhr
in der Erbse

Sa, 16. März Tag der offenen Tür

in der Algenwelt ecoduna von 10-17 Uhr
Eco-Plus Park 1. Straße. 8, 2460 Bruck/Leitha



Omega 3 Fatty Acid extraction

EPA - essential Omega3 FA

- Mostly from fish and krill oil
- Health claims
 - Brain development of babies
 - Reduces heart attack risk
 - (Daily recommended intake 0,5g)

Open points

- Biomass pre-treatment
 - Particle size
 - Extracibility of FA
 - Cell wall treatment
- Solvent/technology
- Yield - efficiency





Requirements on algae biomass for successful CO₂ extraction

- Prompt inactivation of enzymes after harvesting
- Proper cell disruption – methods are strains specific
- Particle size in the range of 300 – 800µm – pelletizing, agglomeration recommended
- Water content - 8 – 12 % – optimum

Difficulties of CO₂ extraction

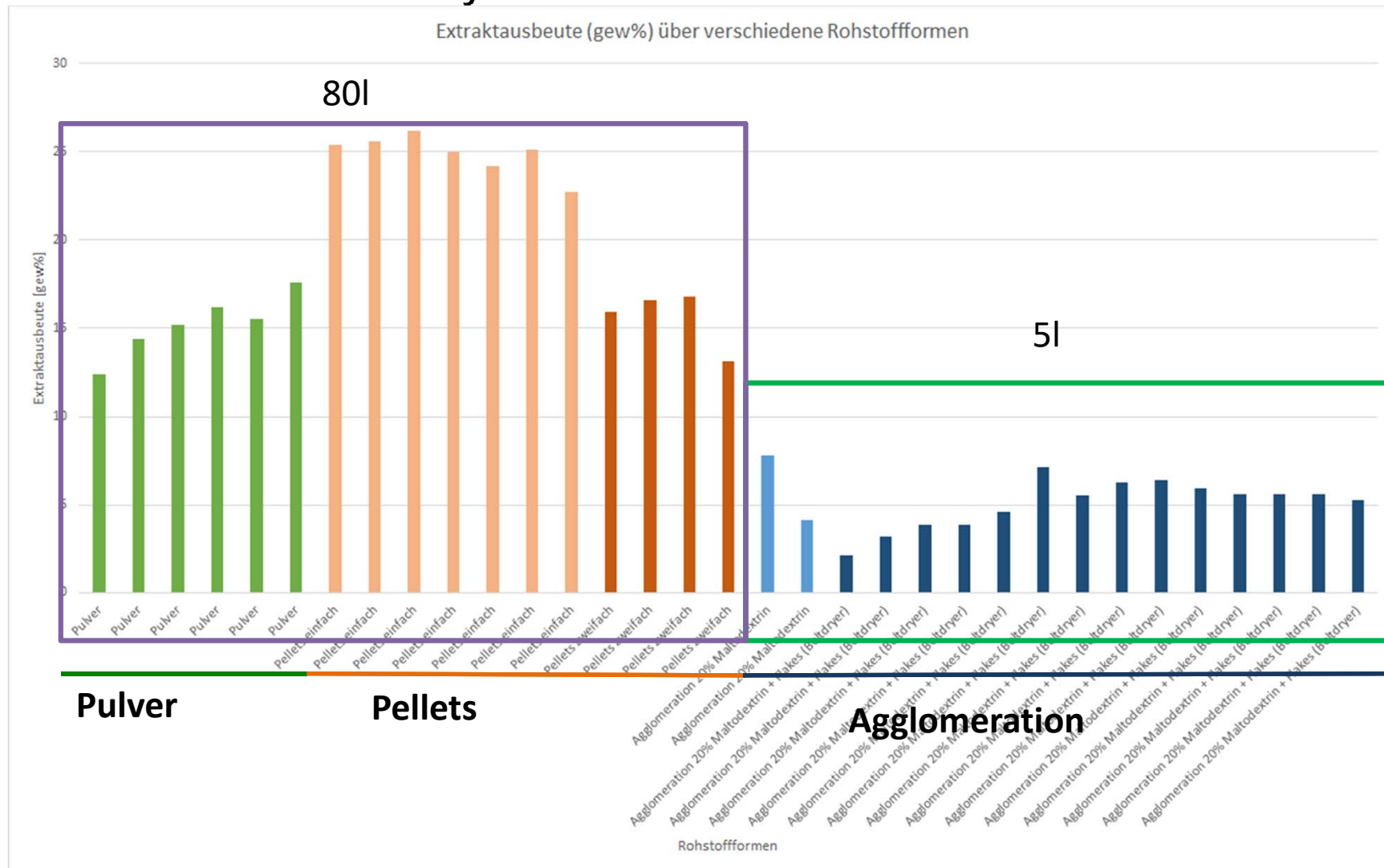
- Different algae strains require different pre-treatment strategies
- Most of the algae biomass is dried by spray drying – other drying techniques required (belt drying, drum drying)
- Fatty acids are distributed over 3 lipid classes – neutral lipids, phospholipids and glycolipids – only neutral lipids are easily extractable by CO₂, PL&GL having limited solubility in CO₂





Extraction – process development

Yield - Extractability





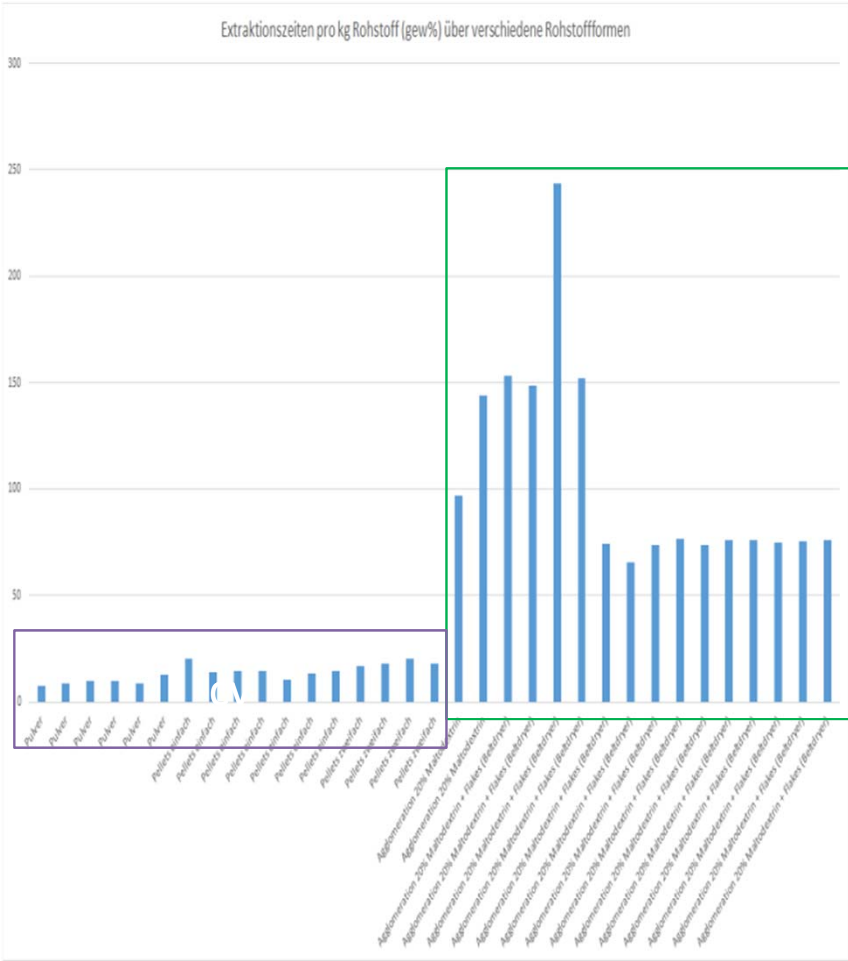
Extraction with CO₂ – solubilities

EASILY SOLUBLE	REDUCED SOLUBILITY	NOT SOLUBLE
esters, alcohols	triglycerides	sugars
aldehydes, ketones	waxes	organic acids
volatile oils	polyphenols	polysaccharides
free fatty acids	alkaloids	proteins
aromas	pigments	phospholipids
monoterpenes		glycolipids

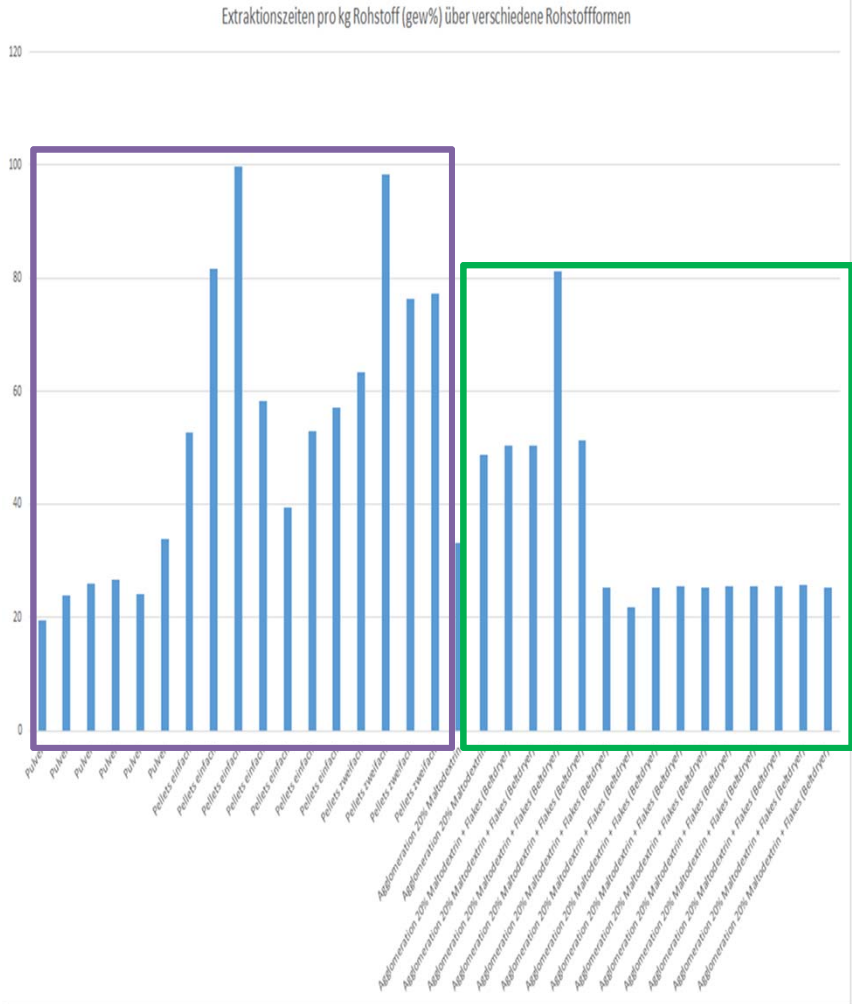
Process parameters ssCO₂



Extraction time per kg biomass



Amount of CO2 per kg biomass



Summary



- PBR technology works reliably
- Down stream equipment – adaptation to algae
- New products: single algal & mixed recipes (algae+)
- Market entry needs time
- Marketing efforts to propagate the use of algae
- Omega3: Process knowledge still needs to be developed
 - - > high amounts of biomass needed
- Novel food application for EPA extract on-going





Ecoduna – Algae at it's best!

