



ORGANICA

ORGANICA

Treating, Conserving,
and Recycling Wastewater



Discussion Outline



- **Past & Future** of Wastewater Treatment & Reclamation
- How Does an **Organica System** Work?
- **Technical Benefits** of the Organica Solution
- **Who is Organica Water?**
- Components of the **Organica Solution**
- **Where** does the **Organica Solution** Apply?
- **Organica Projects**
- **South Pest Case Study**
- **Vision of the Future**



Traditional Activated Sludge: 100 Years Old, Still With 80-90% Market Share



Traditional Activated Sludge: Large Geographic And “Psychological” Footprint



What makes Organica Unique?



Wastewater Engineering

+

Architecture

=

A New Way of Thinking

The Alternative: Organica FCR – Improved IFAS Solution



The Alternative: Organica FCR– Improved IFAS Solution



The Alternative: Highly Visible Tourist Region Le Lude (Loire Valley), France – 6 000 PE



The Alternative: WWT In The Urban Environment

Silver Star (Shenzhen), China – 1 700 PE



The Alternative: WWT In The Urban Environment

Foxconn, China – 17 000 PE



Example: Localization & Enhanced Land Value Canada, Sechelt – 4 000 m³/d Total Capacity





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The Organica FCR Solution

Organica FCR Reactor Is The “Heart of the Solution”

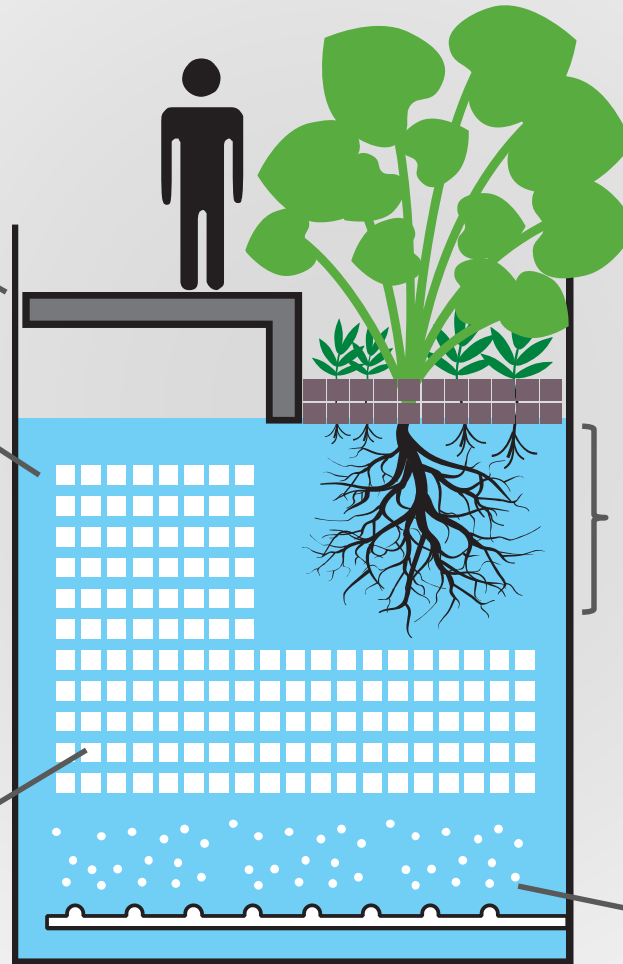
Walkway and plant supporting rack

Activated sludge in suspension

800 species

3-5 kg of biomass /m³

Engineered supporting media



Plants on the supporting mesh

Root zone (up to 1.5m) as fixed film carrier

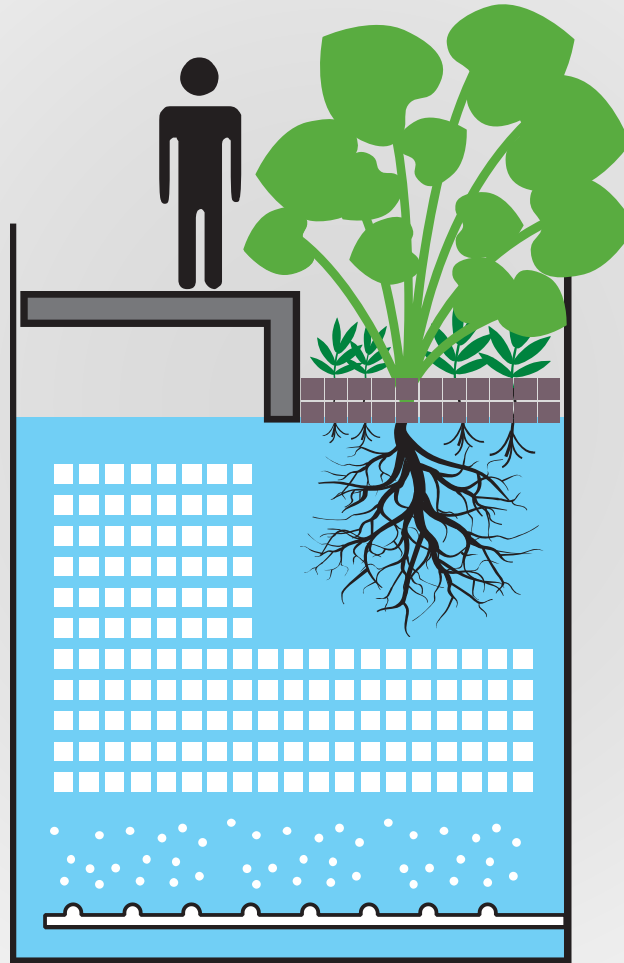
3000+ species

Fine bubble aeration

Organica FCR: More Hungry Mouths Per Cubic Meter

3000 + species

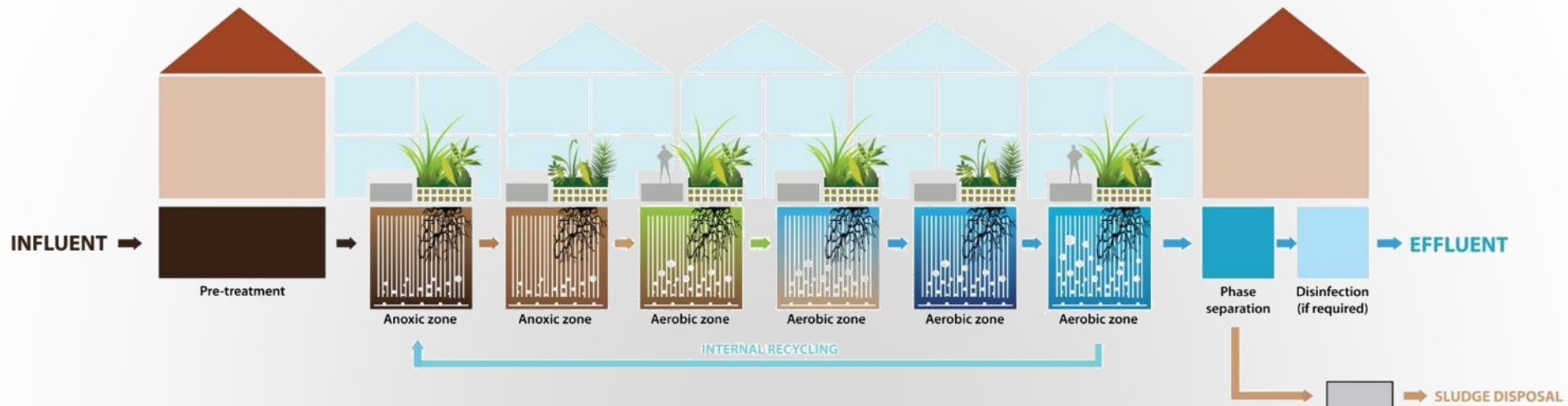
12-18 kg of
biomass /m³



4 x the species of
Activated Sludge

4 x the density of
Activated Sludge

Series Of Food Chain Reactor Zones



- The biological process takes place in a series of cascade reactors, with standard pretreatment at the beginning, and phase separation (via Organica Disc Filters or Secondary Clarifiers) and final polishing at the end.
- As water flows through from one reactor zone to the next, different ecologies will grow and adapt to the conditions in each stage. This configuration allows the “food chain effect” to develop, as higher level organisms become predators for the simpler organisms.
- The result is enhanced removal efficiency and resiliency, while utilizing less energy and producing less sludge.

Organica FCR Summary



The series of ecosystems are configured and managed using the proprietary software algorithms Organica developed based on 10+ years of operational data. We input influent parameters and effluent requirements, and the software suggests the necessary conditions and ecosystem composition (much like a mix of bacteria, plants, and other organisms), constantly optimizing for lowest energy use, minimum treatment time requirement, and minimalized sludge production.

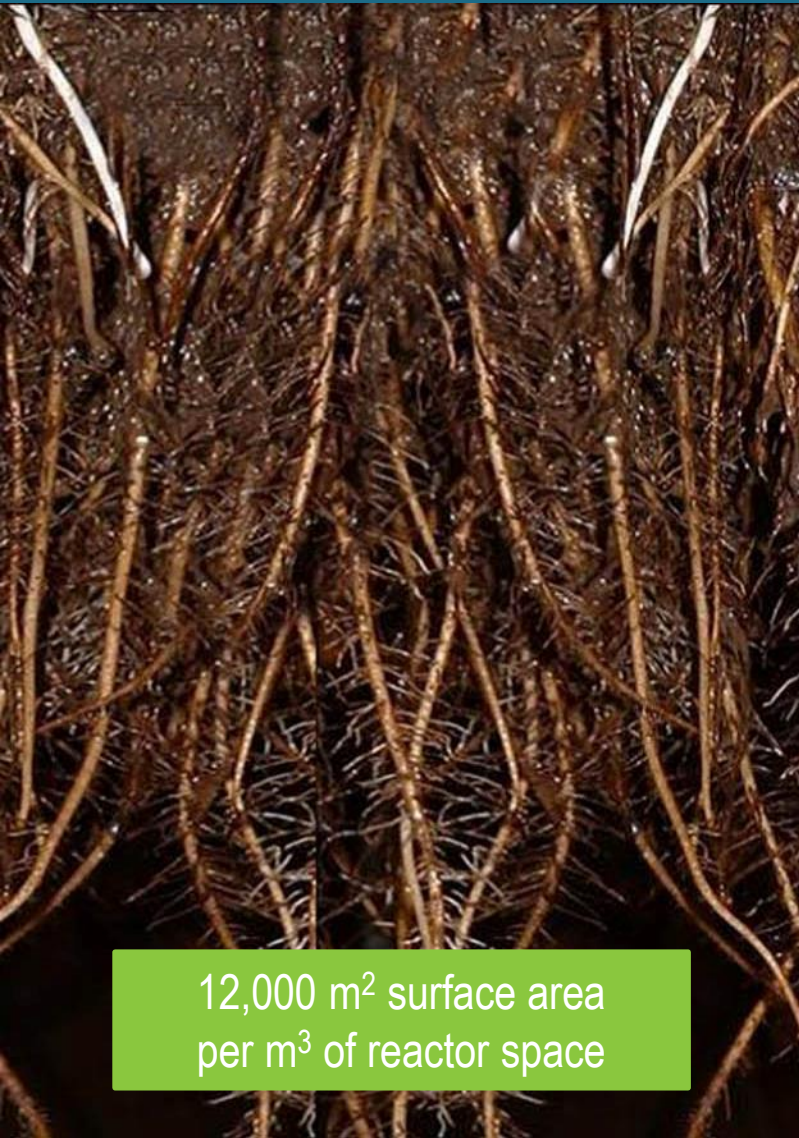
Organica systems are exceptionally robust: in case of a dramatic change in flow rate or influent characteristics the system performs much better due to its diversity. These diverse ecologies are much less prone to collapse than the limited diversity traditional systems.

Throughout the development of the technology special attention has been given to the integration of these facilities into the urban landscape. The result is a botanical garden like structure enclosed in a greenhouse which has no resemblance to traditional WWTPS. Instead, when you see an Organica WWTP it conjures up images of water gardens and nature, fusing harmoniously into the urban landscape.

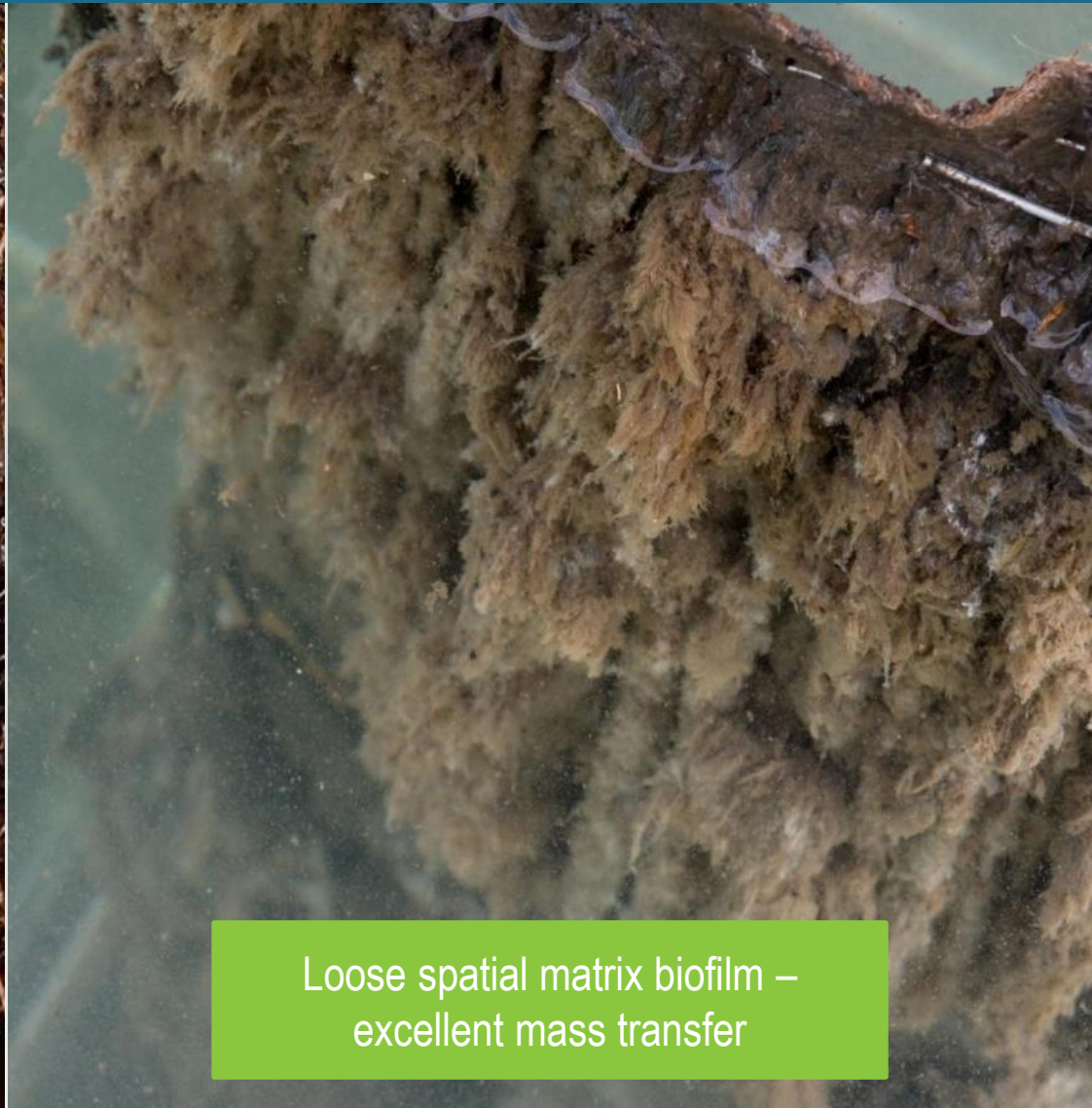


Plants are selected for their root structure, root mass and their ability to withstand the conditions in various reactors. Only locally available species are used, plants are never transported across borders. Plant maintenance comprises of simple gardening practices that can be performed by ordinary wastewater plant operators, no special skills are required.

Combination Of Natural And Engineered Root Structures Provides Large Biofilm Mass In Small Volume



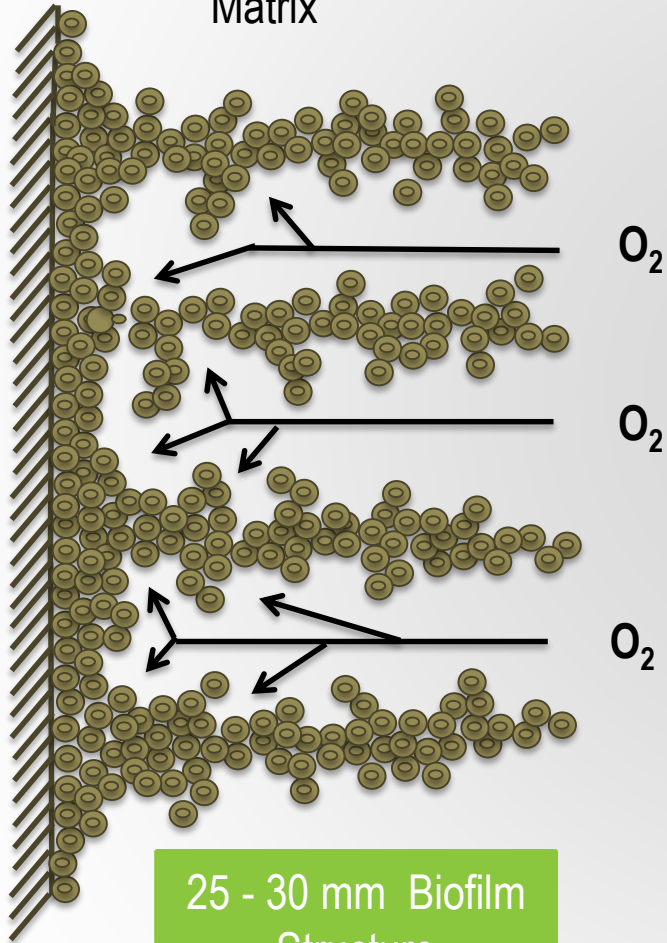
12,000 m² surface area
per m³ of reactor space



Loose spatial matrix biofilm –
excellent mass transfer

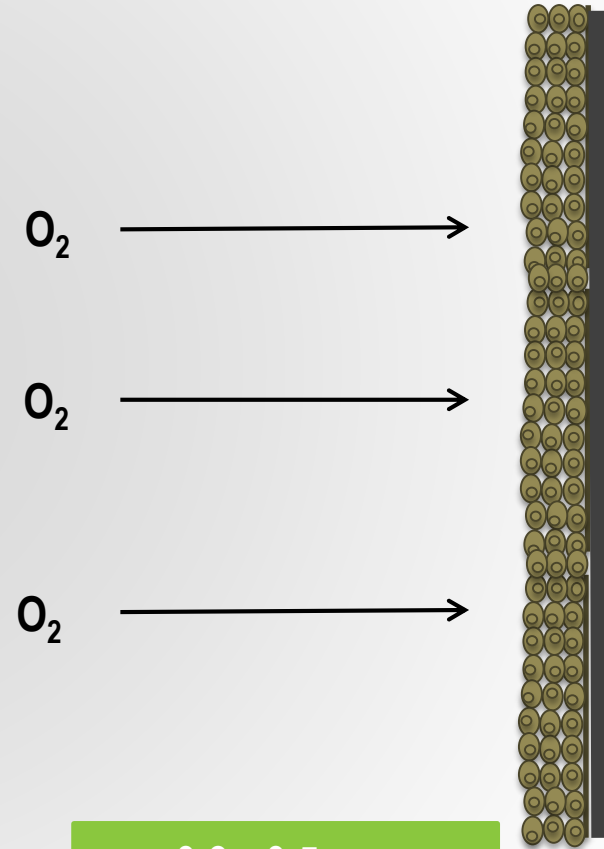
FCR Spatial Matrix Provides Improved Mass Transfer Efficiency

FCR Biofilm Loose Spatial Matrix



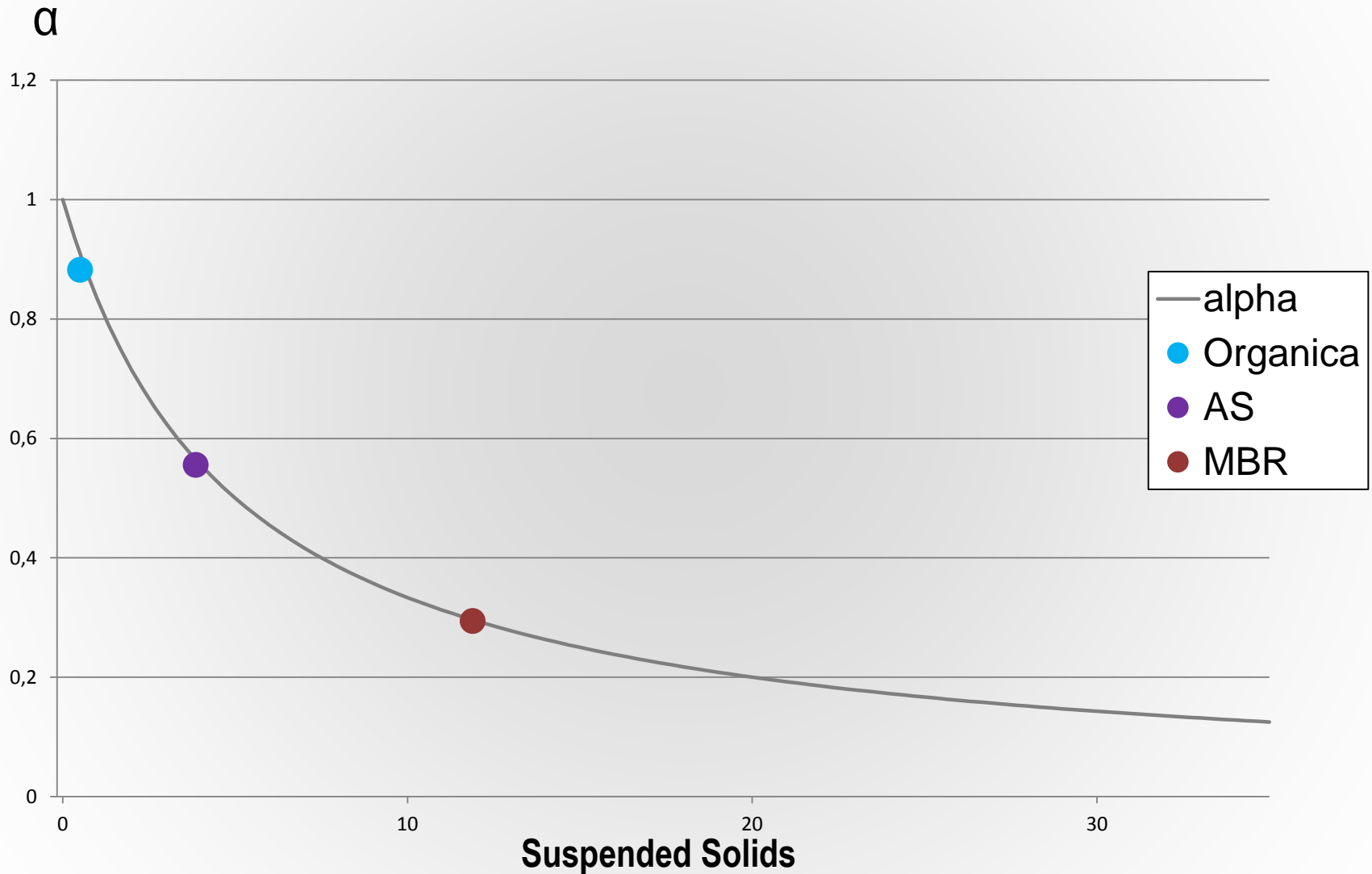
25 - 30 mm Biofilm Structure

Conventional Fixed Film Biofilm Structure

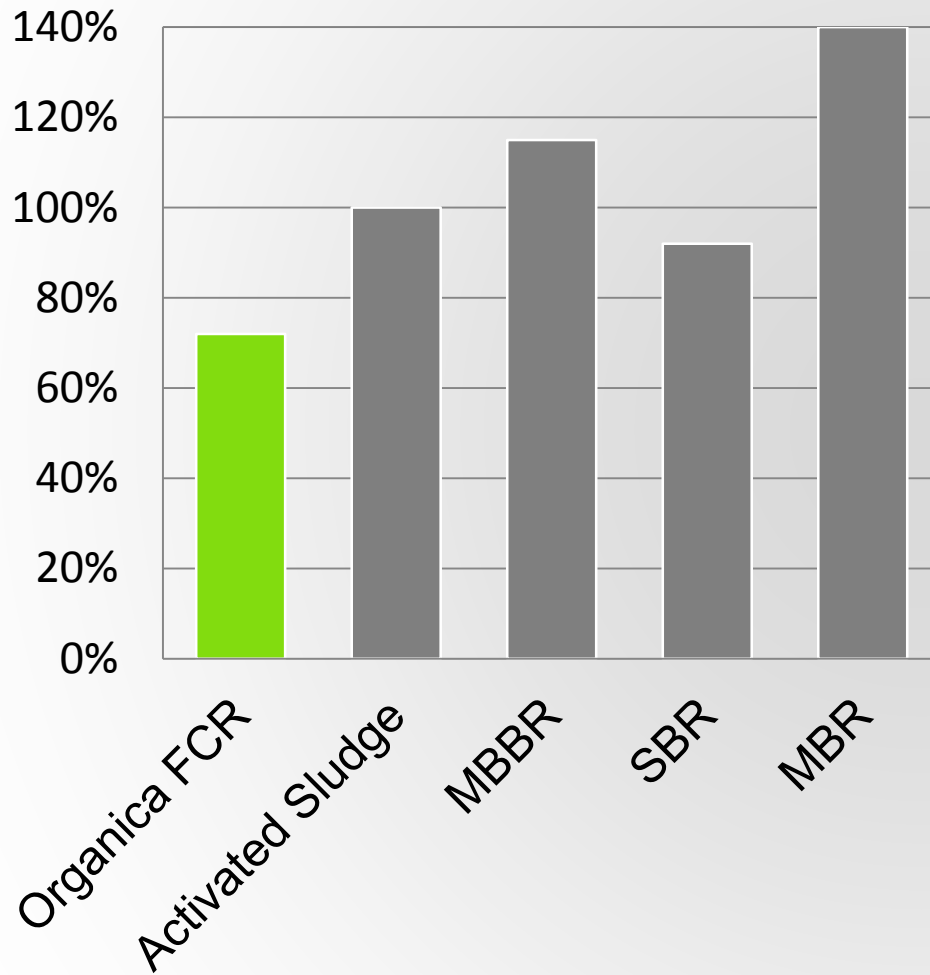


0.3 - 0.5 mm Biofilm Thickness

Lower Suspended Solids Concentration Improves Oxygen Transfer Efficiency (and reduces energy use)



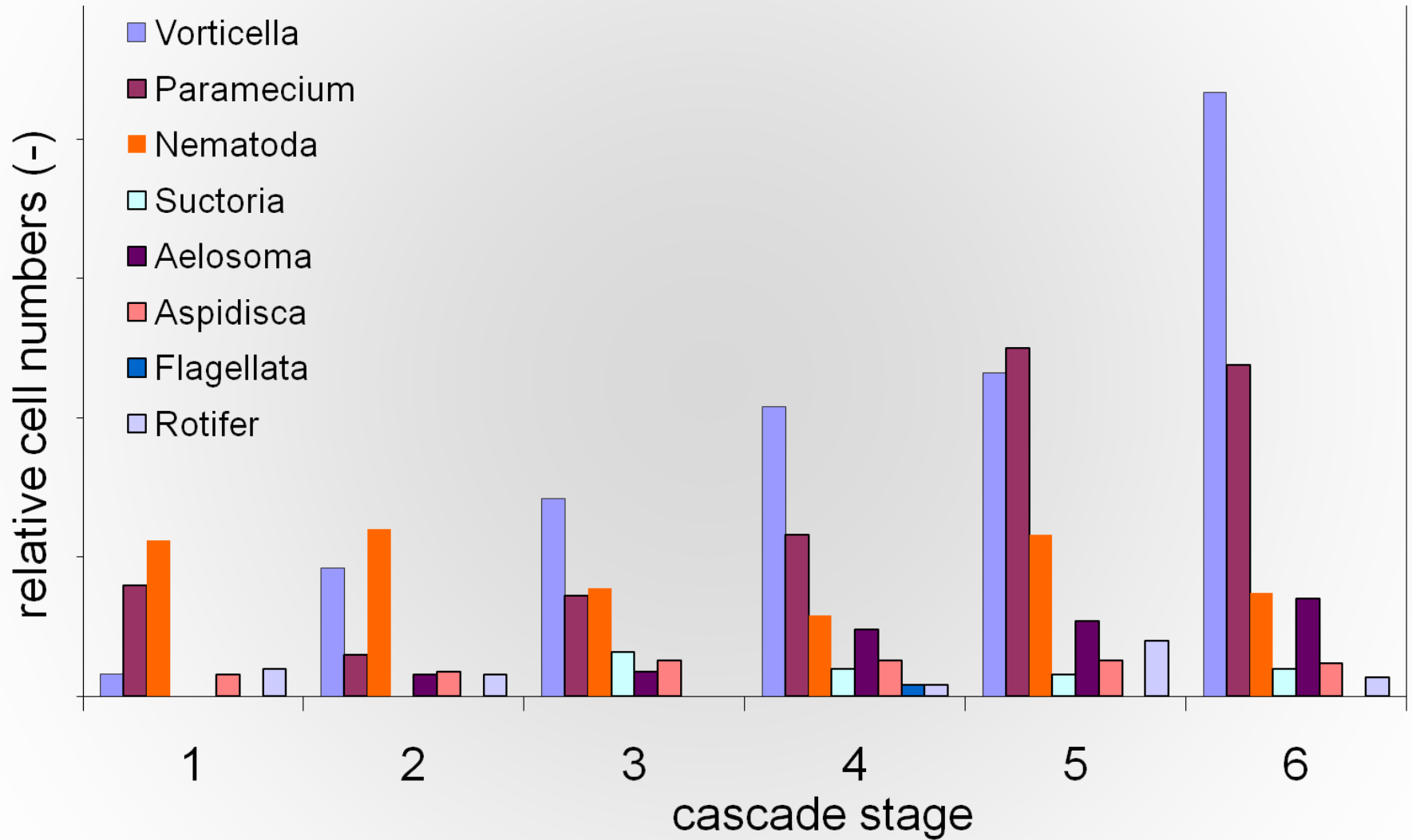
Organica FCR Requires Significantly Less Energy Than Competitive Technologies



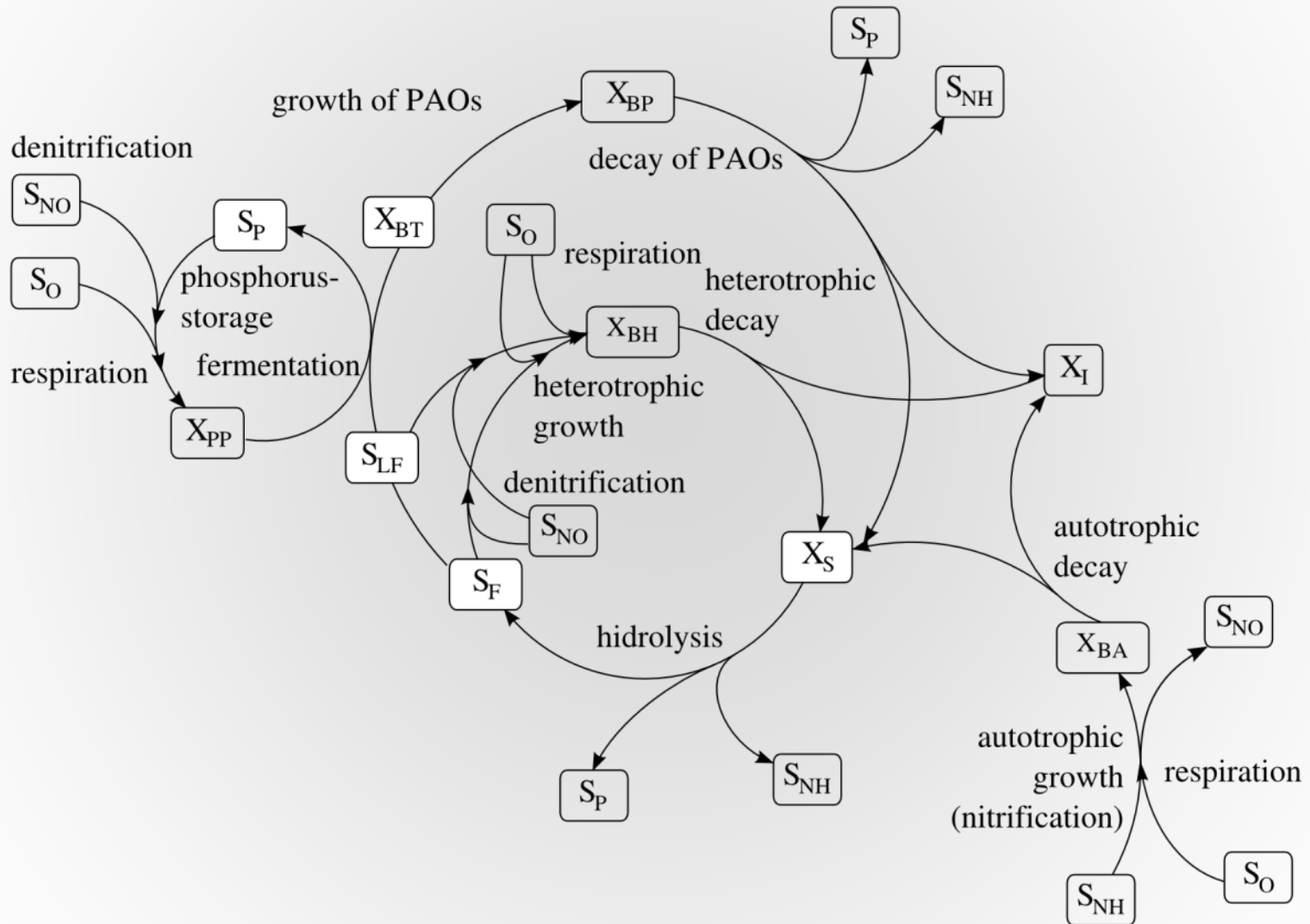


- BACTERIA
- PROTOZOA
- WORMS (Nematodes, Rotatoria)
- MOLLUSC (MUSSELS, SNAILS)
- ARTHROPOD (CRAYFISH)
- PLANTS
- FISH

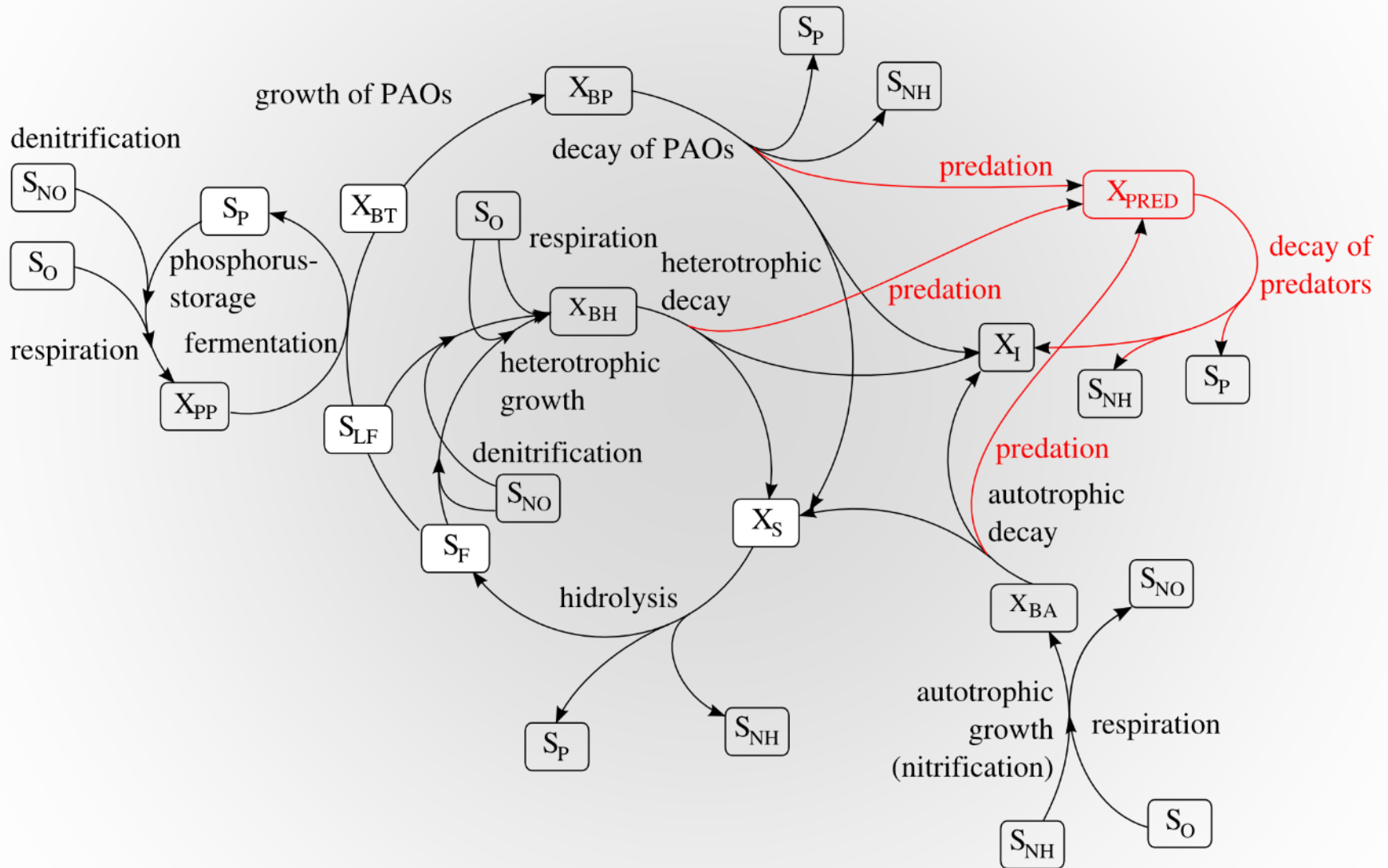
Cascade Design With Fixed Biofilm Results In Each Reactor Developing A Distinct Ecosystem



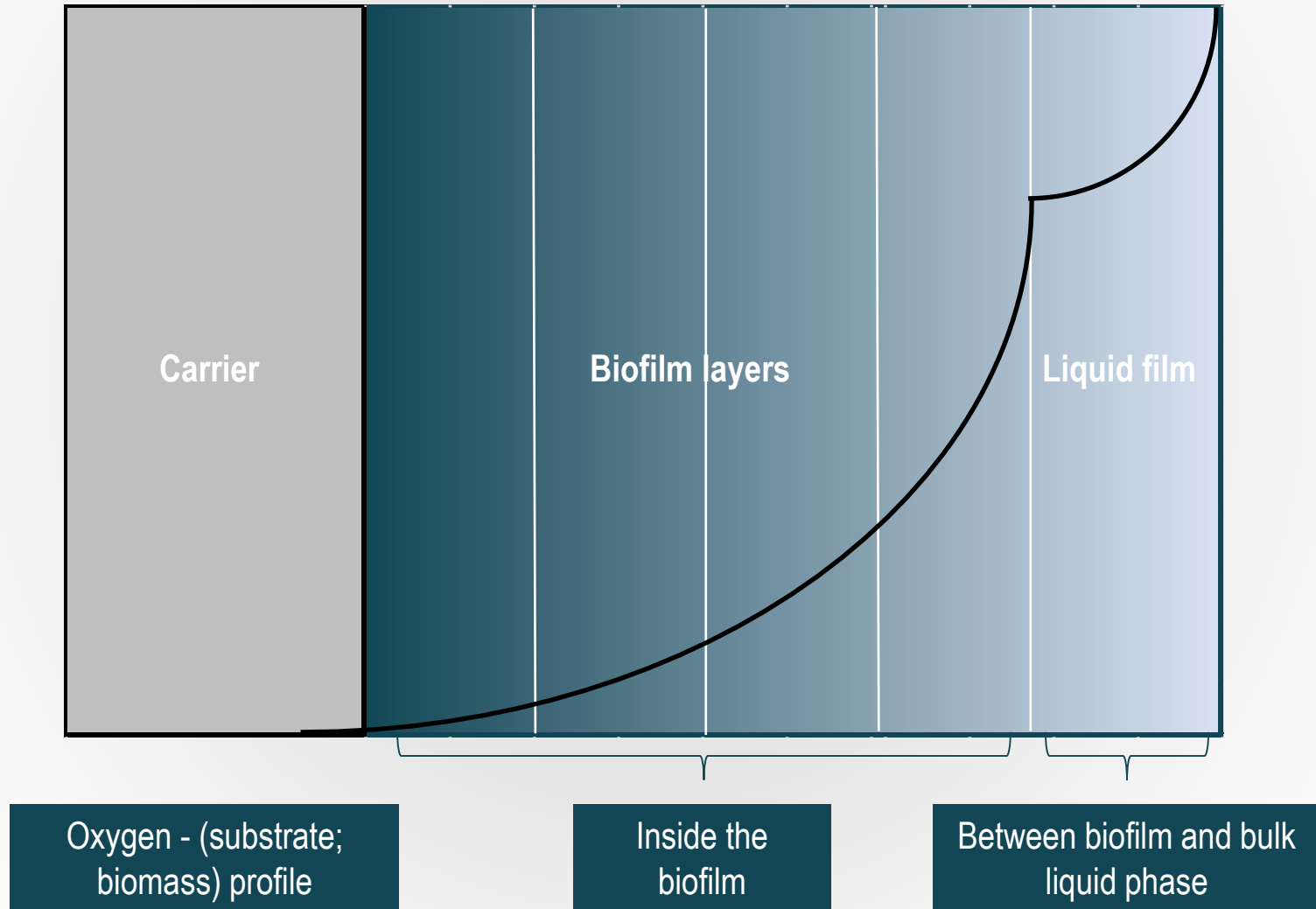
Standard Industry Model – ASM2D



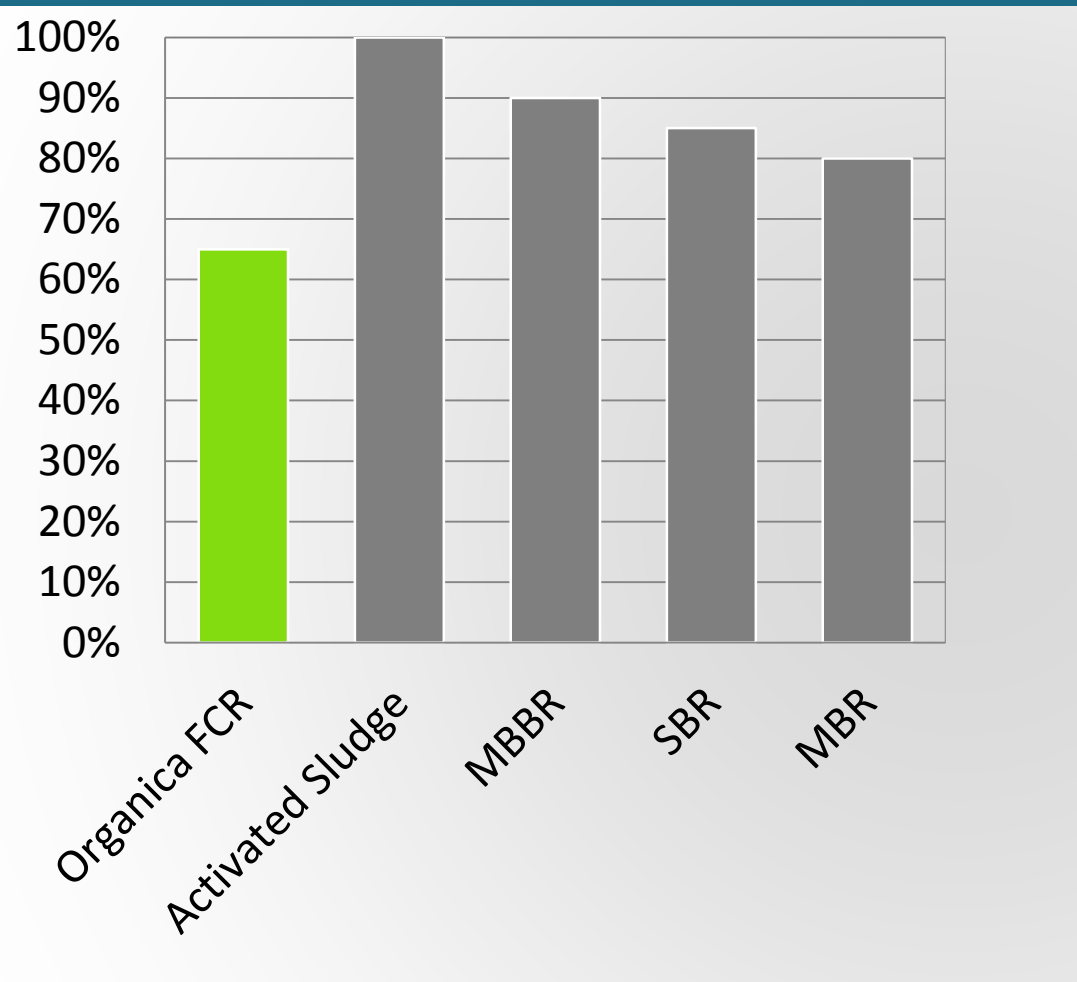
Model Modification Including FCR Predation



Organica Modeling Process Includes Mass Transfer Decay Through Each Biofilm Layer

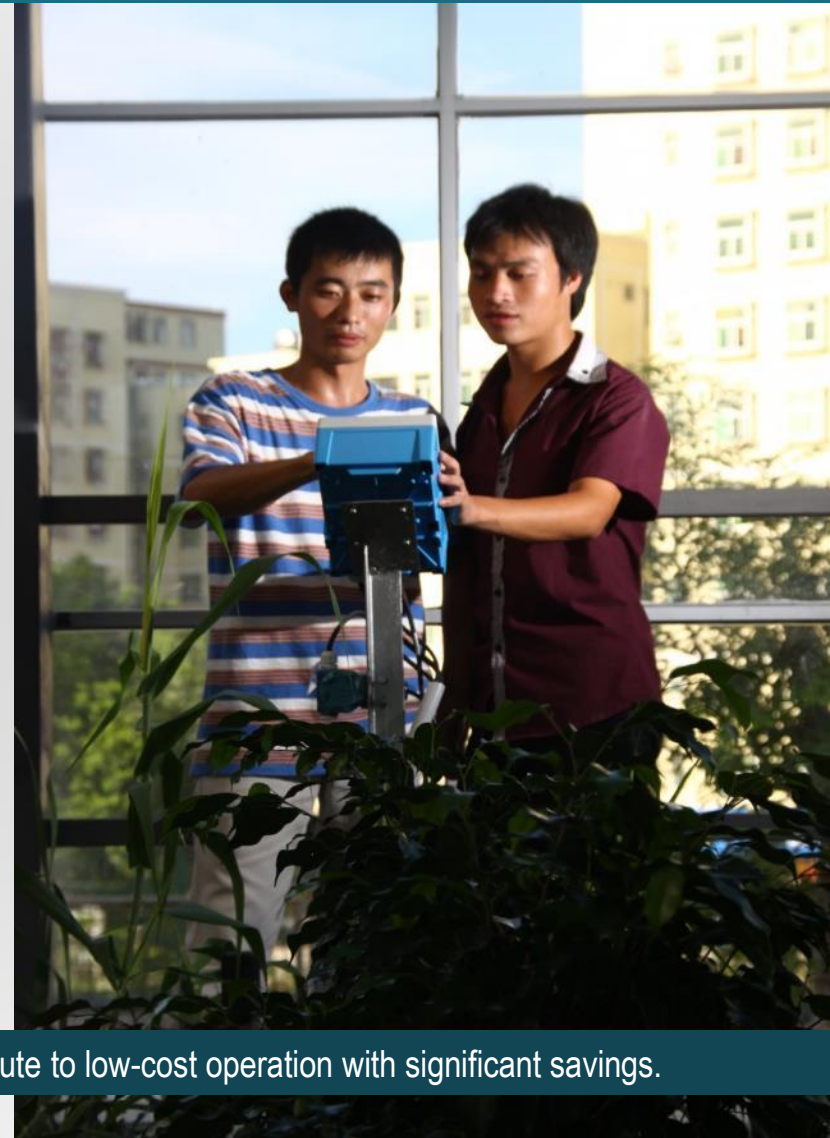
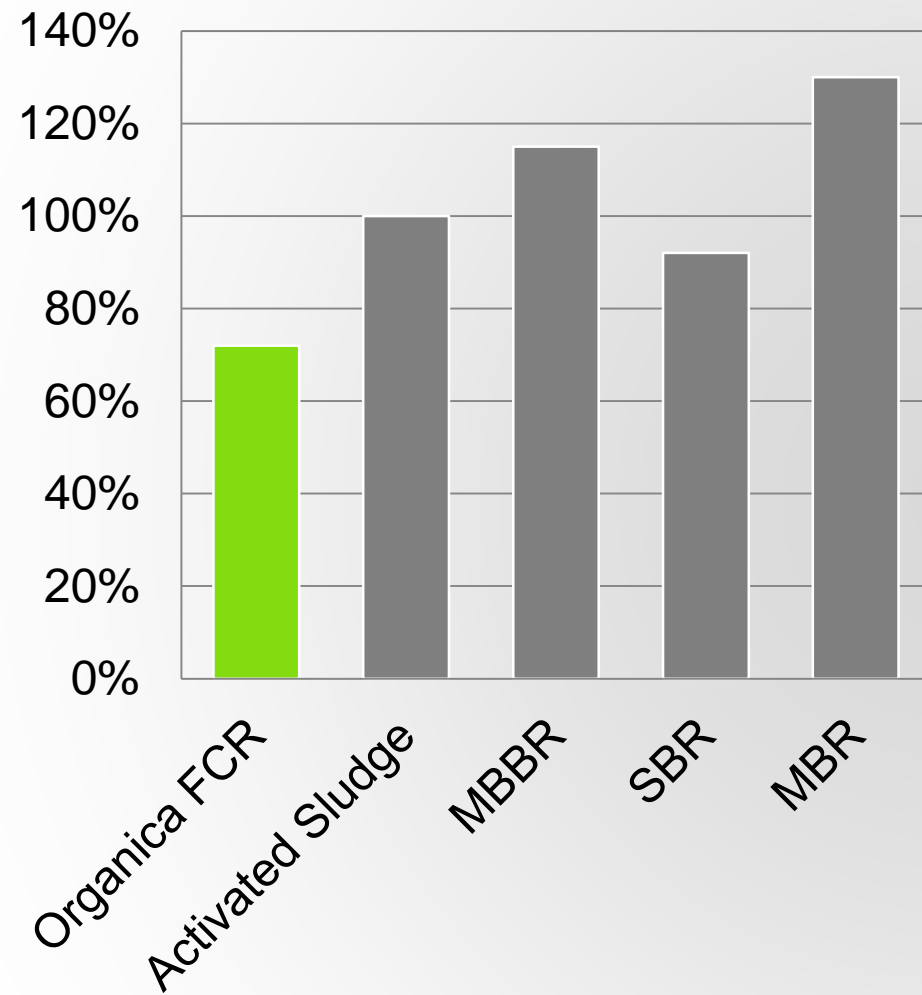


Organica FCR With Diverse Ecosystems Results In Significant Reduction In Sludge (WAS)



Excess sludge contributes significantly to operational costs. Thanks to the complex ecosystem, sludge production in Organica plants range from appreciably lower to comparable, depending on the specific waste stream and the corresponding technical configuration.

Organica FCR Operating Costs Are Significantly Less Than Competitive Technologies



Organica plants use less energy; produce less sludge. These factors all contribute to low-cost operation with significant savings.

Organica Disc Filter Offers Significant Footprint Reduction Over Secondary Clarifiers



Secondary Clarifier



Disc Filter Unit

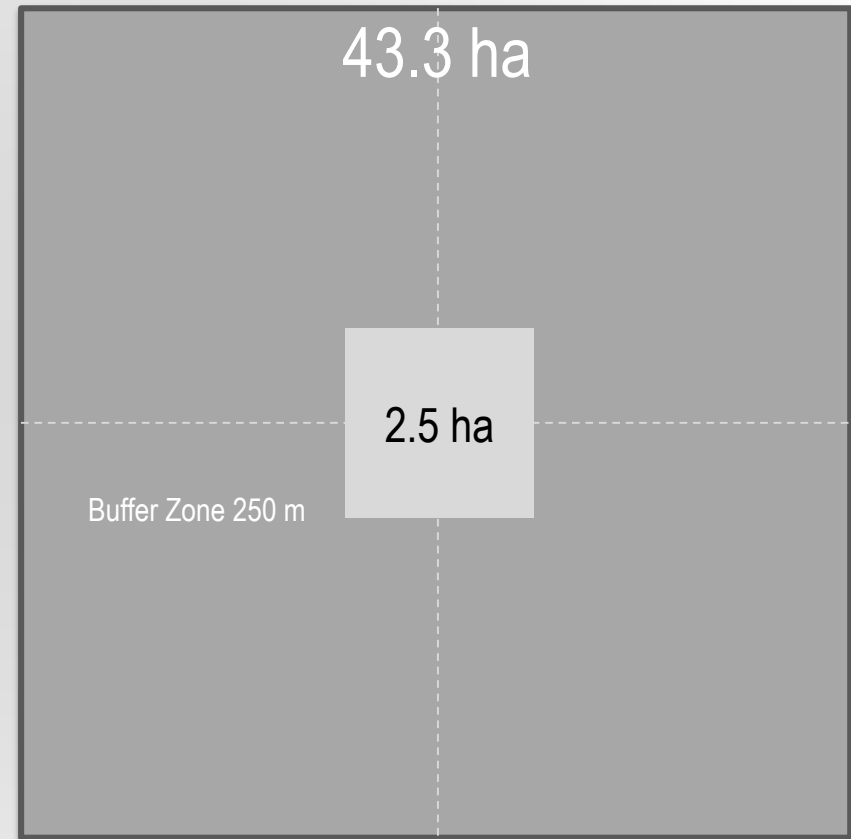
Complete Organica FCR Design Provides Compact And Efficient Solution



Activated Sludge Footprint Can Be Significant For Both Treatment Facility and Buffer Requirements

Example

50 MLD traditional WWTP
Plant: 2.5 ha
Buffer zone 250 m
Total area: 43,3 ha

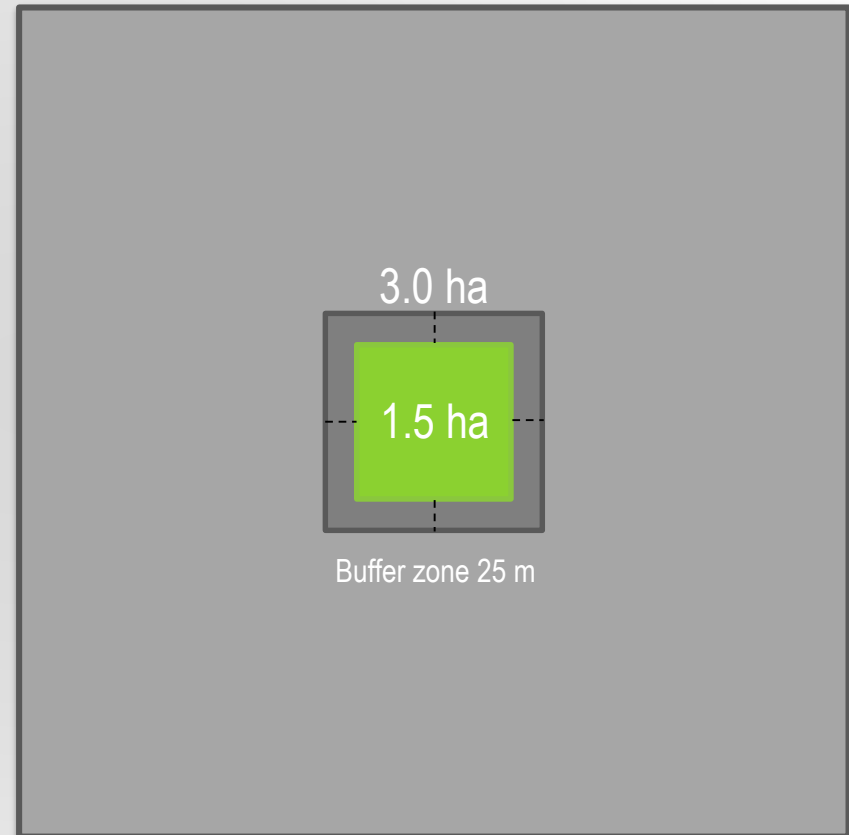


Organica FCR Reduces Both Treatment System And Buffer Zone Space Requirements

Example

50 MLD Organica FCR WWTP
Plant: 1.5 ha
Buffer zone 25 m
Total area: 3,0 ha

40.3 ha savings with increased value



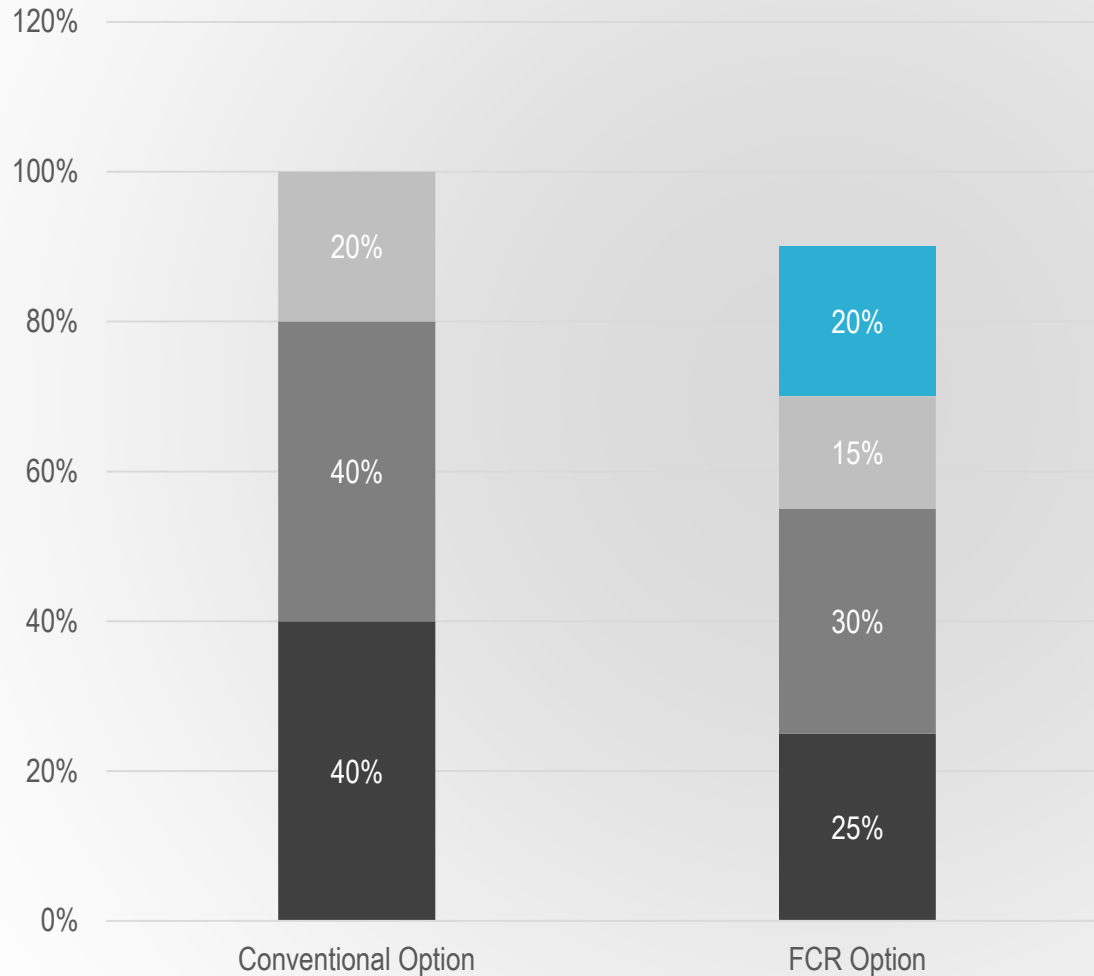
Land Savings Provides Significant Value



Location	Potential savings in land value
UK - central	\$100M - \$300M
UK - countryside	\$10M - \$50M
Turkey - coast	\$500M
India	\$30M - \$60M
SE Asia	\$80M

Organica Savings Exceeds Cost

Capital Investment Cost Breakdown



10% Savings
on Total Capital
Cost

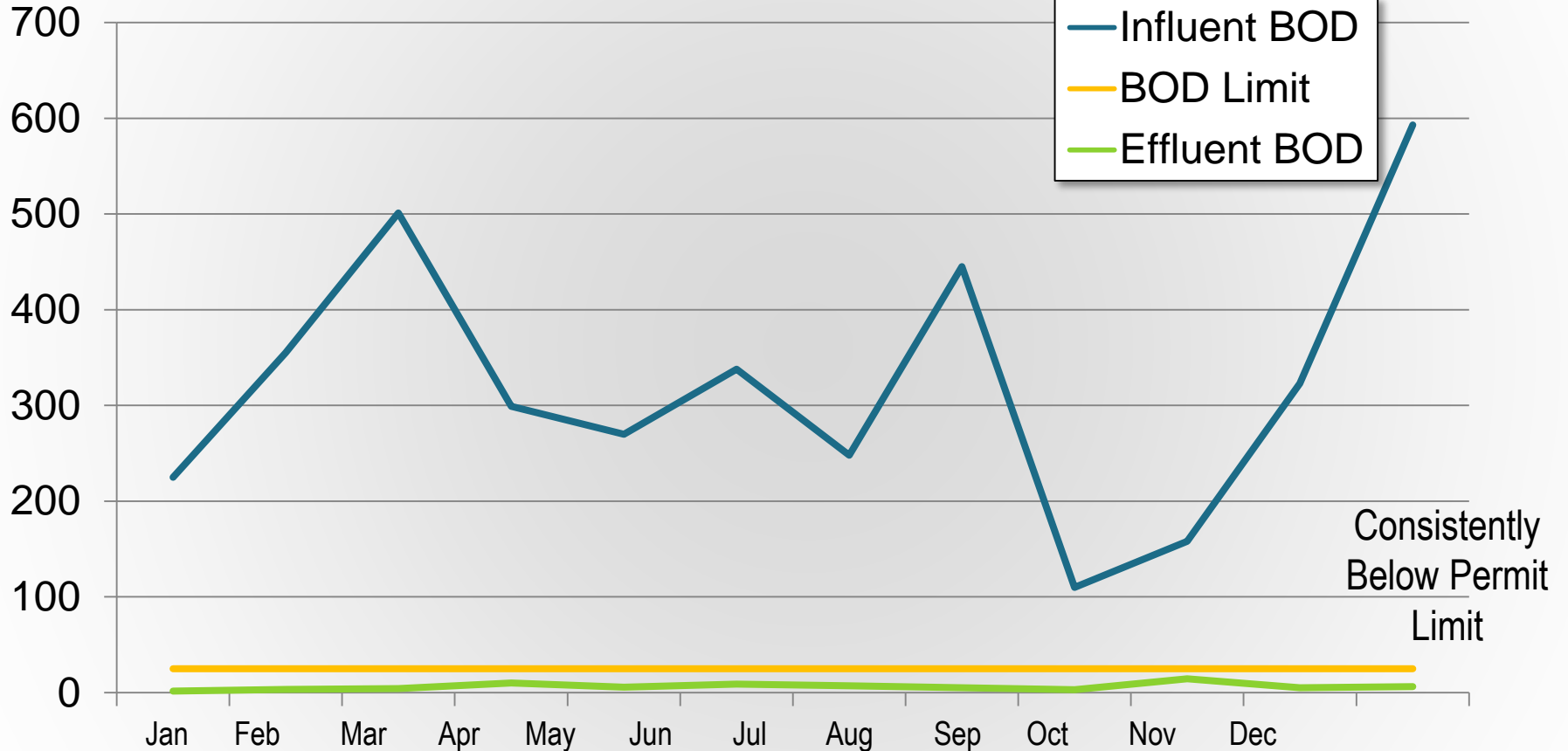
- Organica
- Engineering
- Mechanical & Electrical
- Civil Works

Existing Operations Demonstrate Stable & Efficient BOD Removal



BOD (mg/l)

(data from Telki, Hungary facility)



The Importance Of “Psychological Footprint”



Facilities Provide Community Interaction And Benefits



Organica FCR Offers Significant Advantages

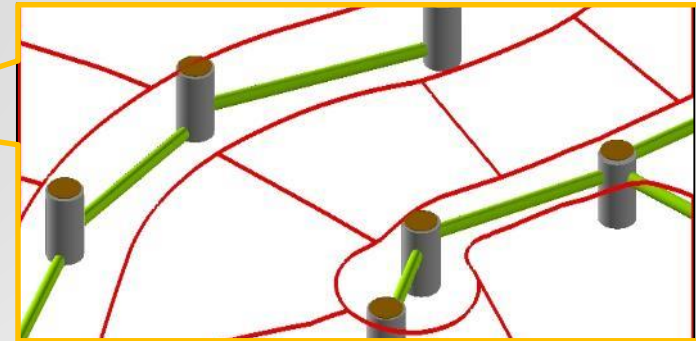
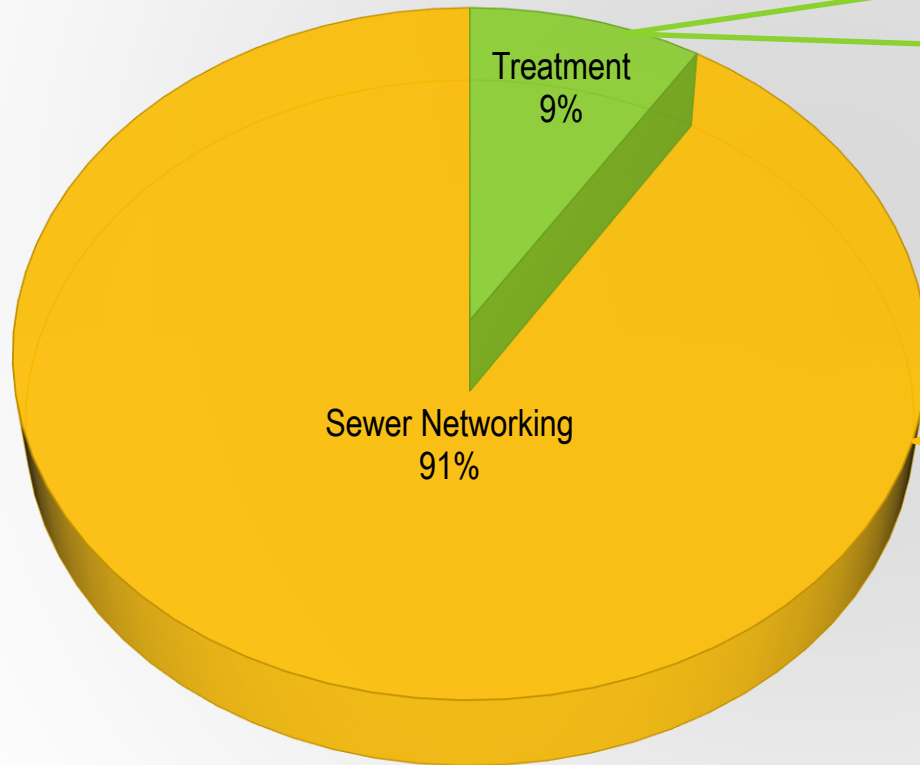


- Up to 60% Reduction In Physical Footprint
- 30% or Greater Reduction in Operating Expense (OPEX), driven by lower energy and sludge production
- Enhanced Biodiversity - Resilient and Stable System
- Unique Look & Feel enables WWTP to be strategically located virtually anywhere



Sewer Network Costs Greatly Outweigh Treatment Costs

WASTEWATER MANAGEMENT COSTS





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Who is Organica Water?

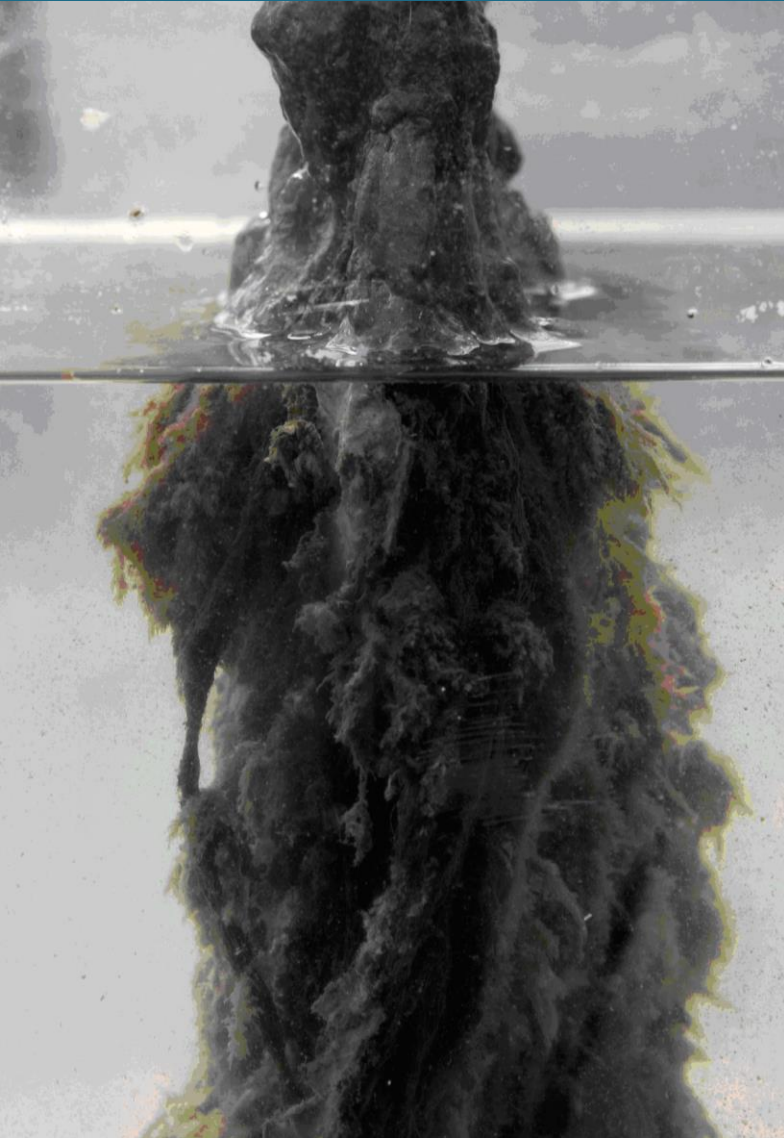
International Team Brings Diversity of Perspectives and Talents

Who Is Organica?



- Provider of cost and space efficient solutions for biological wastewater treatment
- 15 years of history and 50+ references operating / under construction up to 80,000 m³/d
- Organica provides facility design and specialty equipment supply, enabling local EPC contractors and consultants deliver projects
- The future standard “operating system” for municipal wastewater treatment plants (WWTPs) in the 21st century

Over 15 Years Experience Using Root Structures As A Biofilm Carrier



1998| Founded as a Wastewater Design/Build business focused on the Hungarian market

1999| Receives private investment to help fund the growth of the business

2001| Merges with 6 companies to become Körte-Organica, one of Hungary's largest environmental solution providers at the time

2001-2006| Builds over 75 different municipal, commercial, and industrial wastewater treatments and simultaneously invests in R&D

2007| Sells its wastewater Design/Build business to Veolia, and keeps the intellectual property rights to its proprietary IFAS-type solution for biological wastewater treatment

2008| Receives private investment from US /European based VC funds

2009| Signs first contracts in China and France

2010| Opens subsidiary office in India; Contracts 6 WWTPs in France

2011| Signs contract for 80 MLD upgrade of ASP WWTP in Budapest

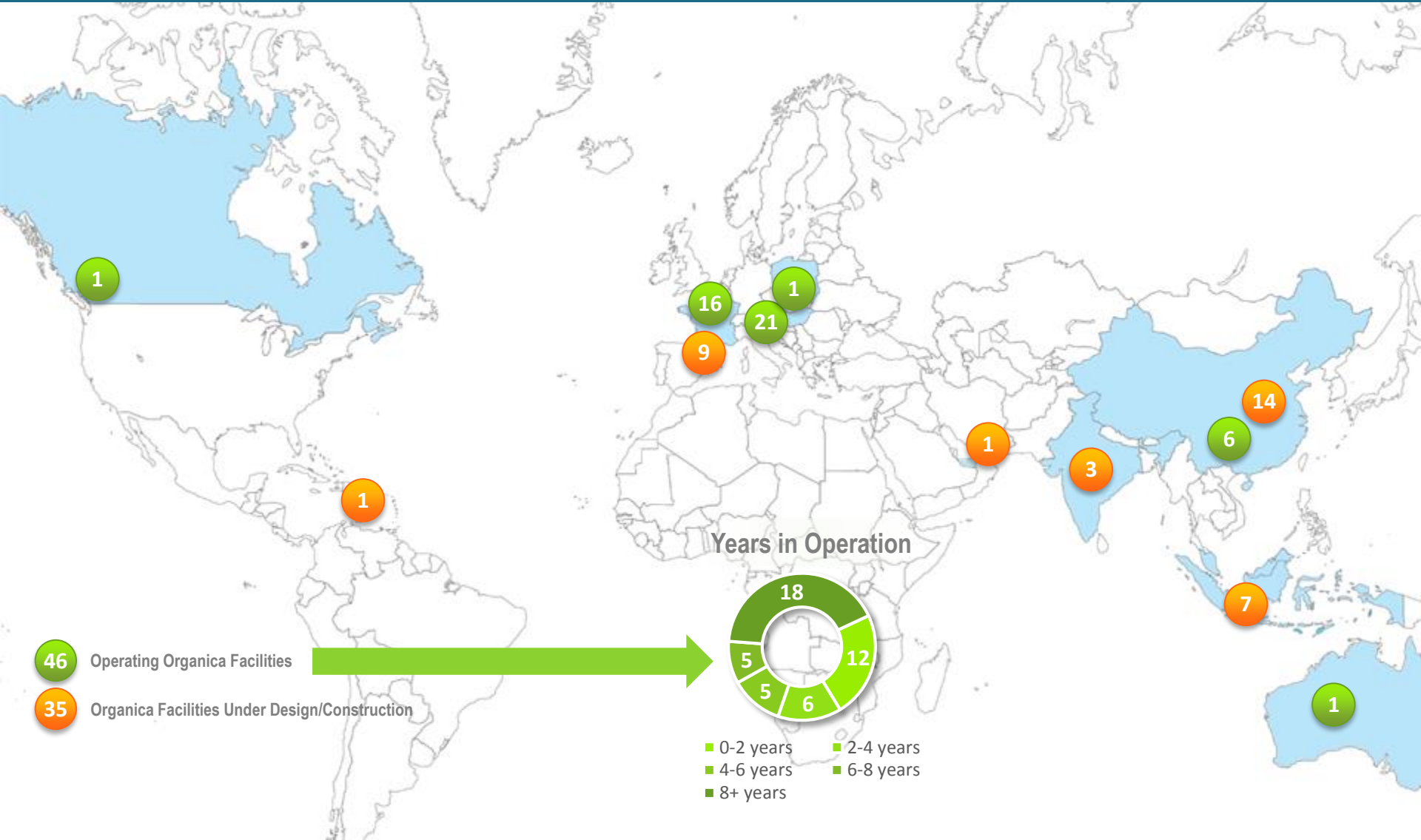
2012| Signs first contracts in India (1.1 MLD) and Indonesia (45 MLD)

2013| Receives investment from IFC (part of World Bank group) and Huaneng Invesco; Signs first upgrade project in China (30 MLD)

2014| Signs first contract in Australia (Pilot project)

2015| Receives investment from XPV Capital Corp. and Idinvest Partners; Signs first contracts in the United Arab Emirates (3.5 MLD) and the Philippines (10 MLD)

A Proven Solution: Organica Facilities Around the Globe



50+ Plants Operating Or Under Construction



China: 17,000 PE



France: 180 PE



Hungary: 8,000 PE



Hungary: 500,000 PE

History Of Awards & Recognition Demonstrates Organica's Unique Solution Offering



Global CleanTech 100 (2015)

Global CleanTech "Company of the Year" (Europe & Israel) for 2013

Global CleanTech 100 (2013)

Global Water Intelligence Wastewater Project of the Year (2013)

Honorable Mention, South Pest WWTP

WEX Innovation Award (2013) Water and Energy Exchange Innovation Award

recognizing significant achievement in the field of Water and Wastewater Management

Presentation to the United Nations (2012) in New York to discuss how Organica represents a new

paradigm in wastewater treatment that will allow the UN to reach its Millennium Development Goals on Water and Sanitation

European Business Awards for the Environment nomination (2010)

by the Hungarian Jury for the EU Environmental Awards

The "Environment Award" (2008)

by the Association of Environmental Manufacturers and Service Providers

Frost & Sullivan Innovation Prize (2005)

for the ORGANICA Technology wastewater treatment solution

Company of the Year (2004)

by the Hungarian Venture Capital and Private Equity Association

Innovation Award (2004)

by the Hungarian Innovation Foundation

The "Environment Award" (2004)

by the Association of Environmental Manufacturers and Service Providers



Global Presence Supports Wide Range Of Geographical Markets



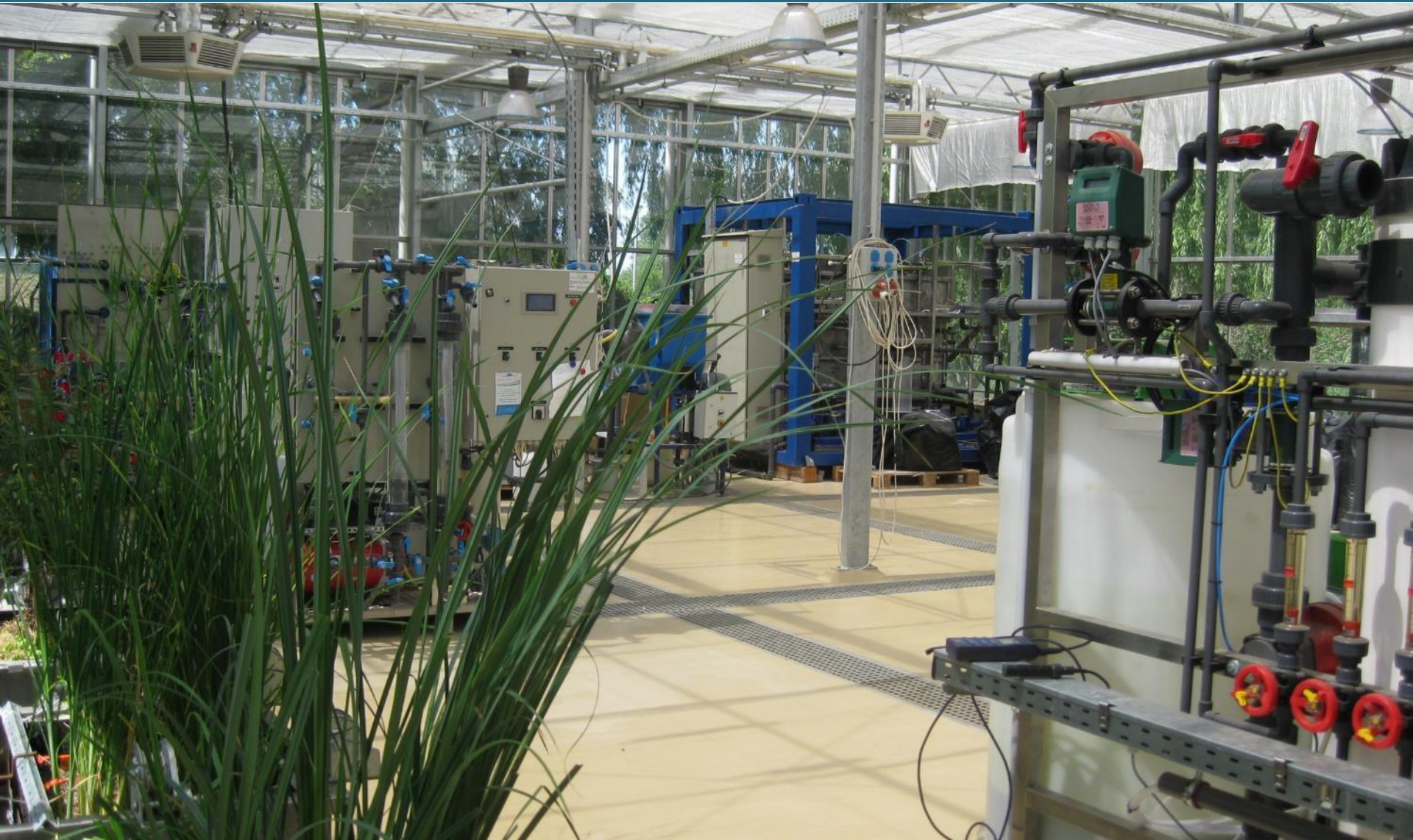
Organica Operates A Comprehensive R&D Facility With Several Complete Treatment Processes



R&D Center With Cascade Reactors In Operation



R&D Center With Multiple Treatment Processes In Operation



R&D Center Is Highly Automated To Collect Online Data And Improved Control Strategies



Organica Offering Of Products And Services Appropriate To Market / Project Needs



- Specialized Organica Products

- ✓ Biomodule
- ✓ Disc Filter
- ✓ Organica Automation Package (Control & Instruments)

- Organica Services

- ✓ Basic Engineering Designs
- ✓ Commissioning Support (Remote or On-Site)
- ✓ Detailed Design
- ✓ Operational Supervision and Process Optimization





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Components Of The Organica Solution

Complete Organica FCR Design Provides Compact and Efficient Solution



Organica Discfilter (or clarifier)



Organica Biomodule

What Is An Organica Biomodule?



Biomodule:

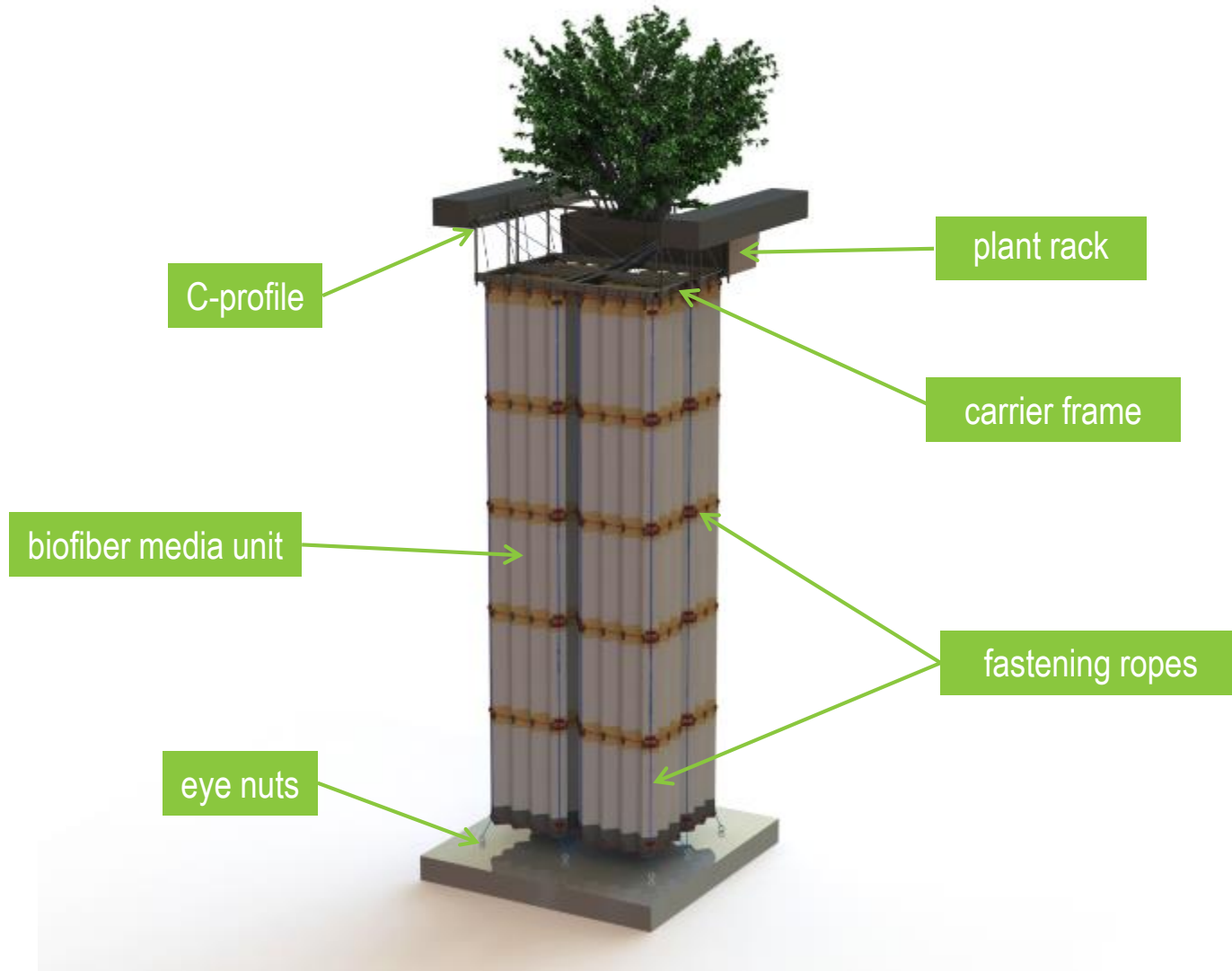
ready-to-install structure
with plant racks and patented
biofiber media units

Purpose:

provides surface for biofilm
growth

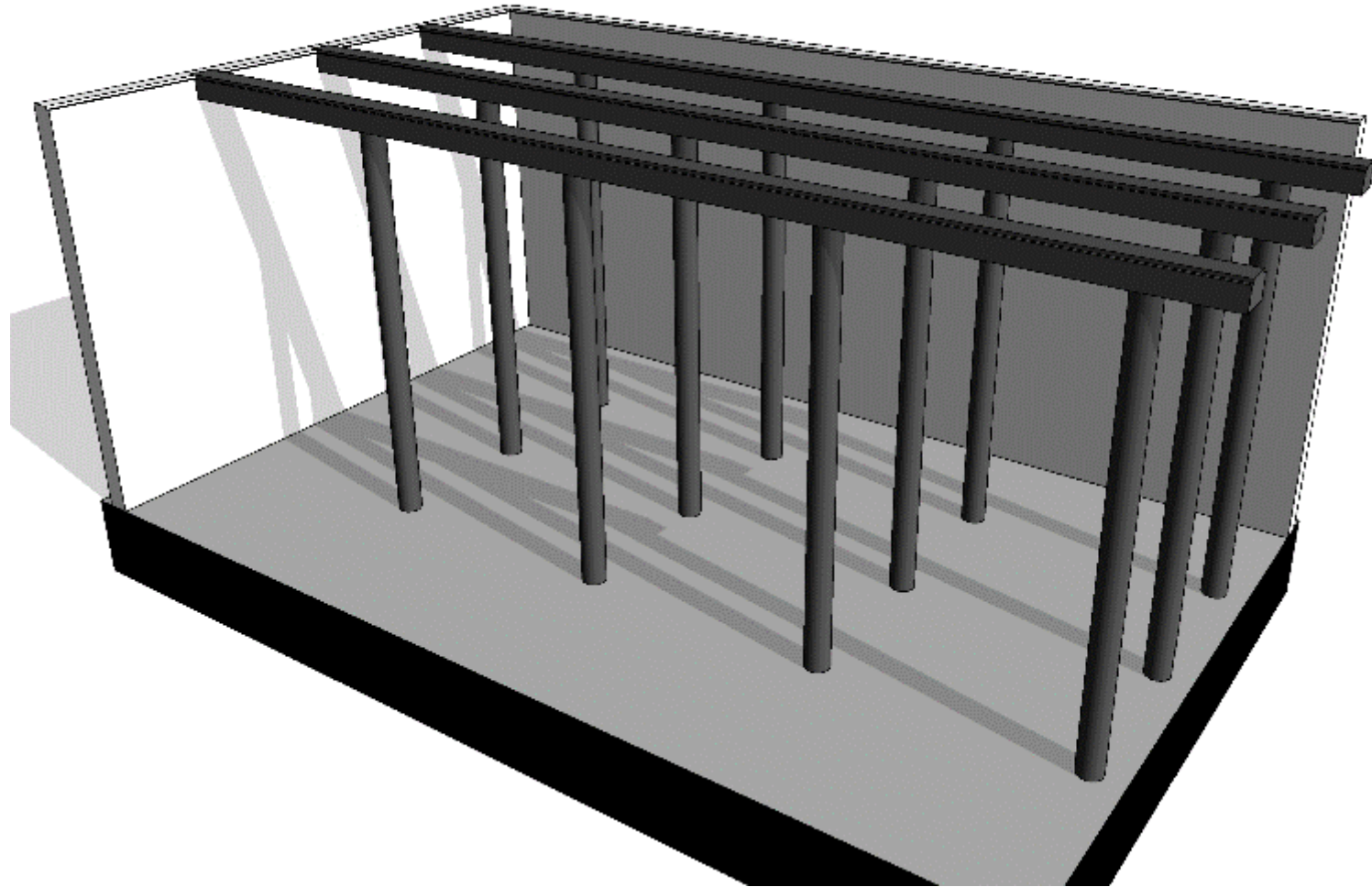


Main Components of the Biomodule

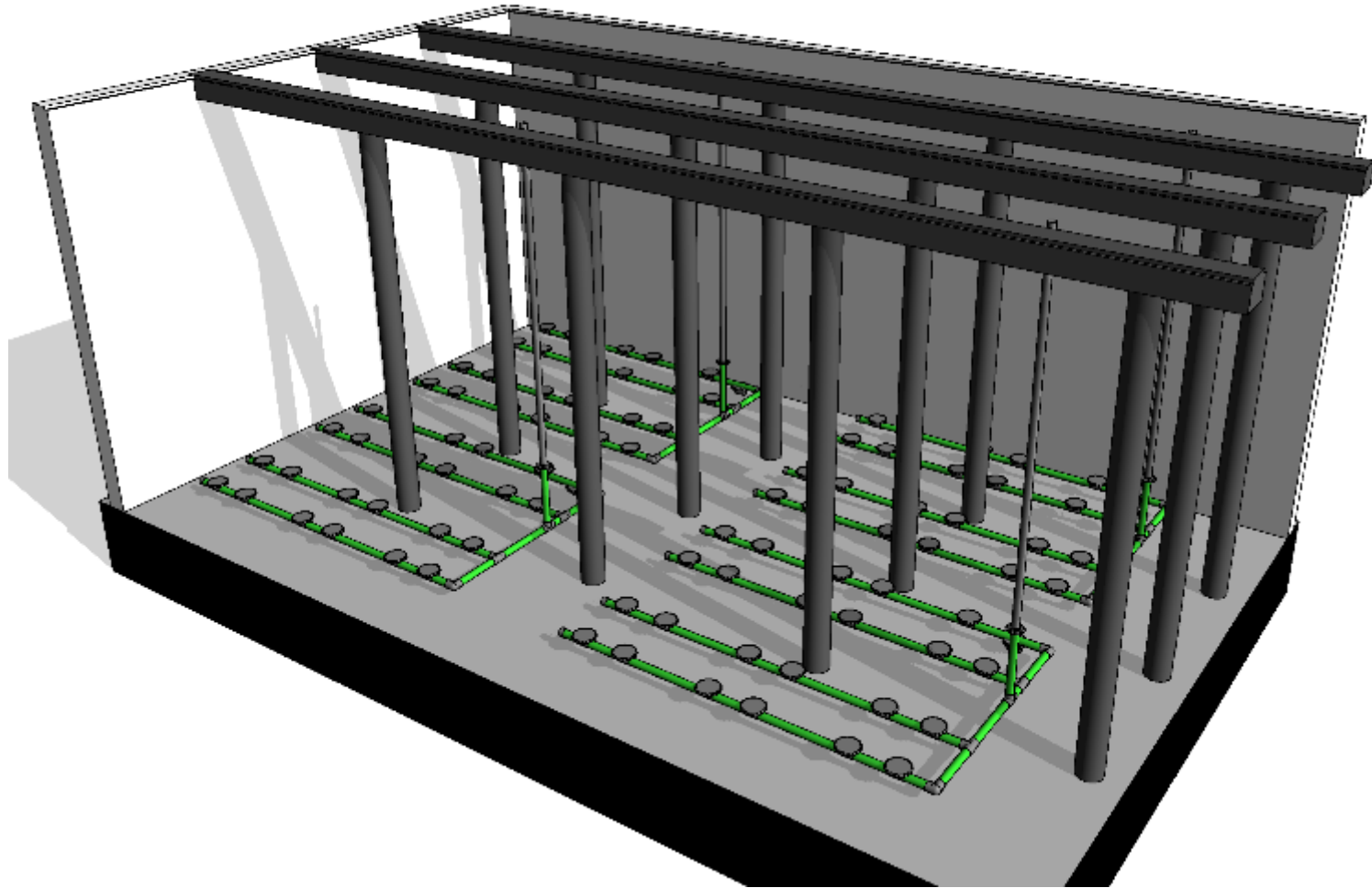


Installation:

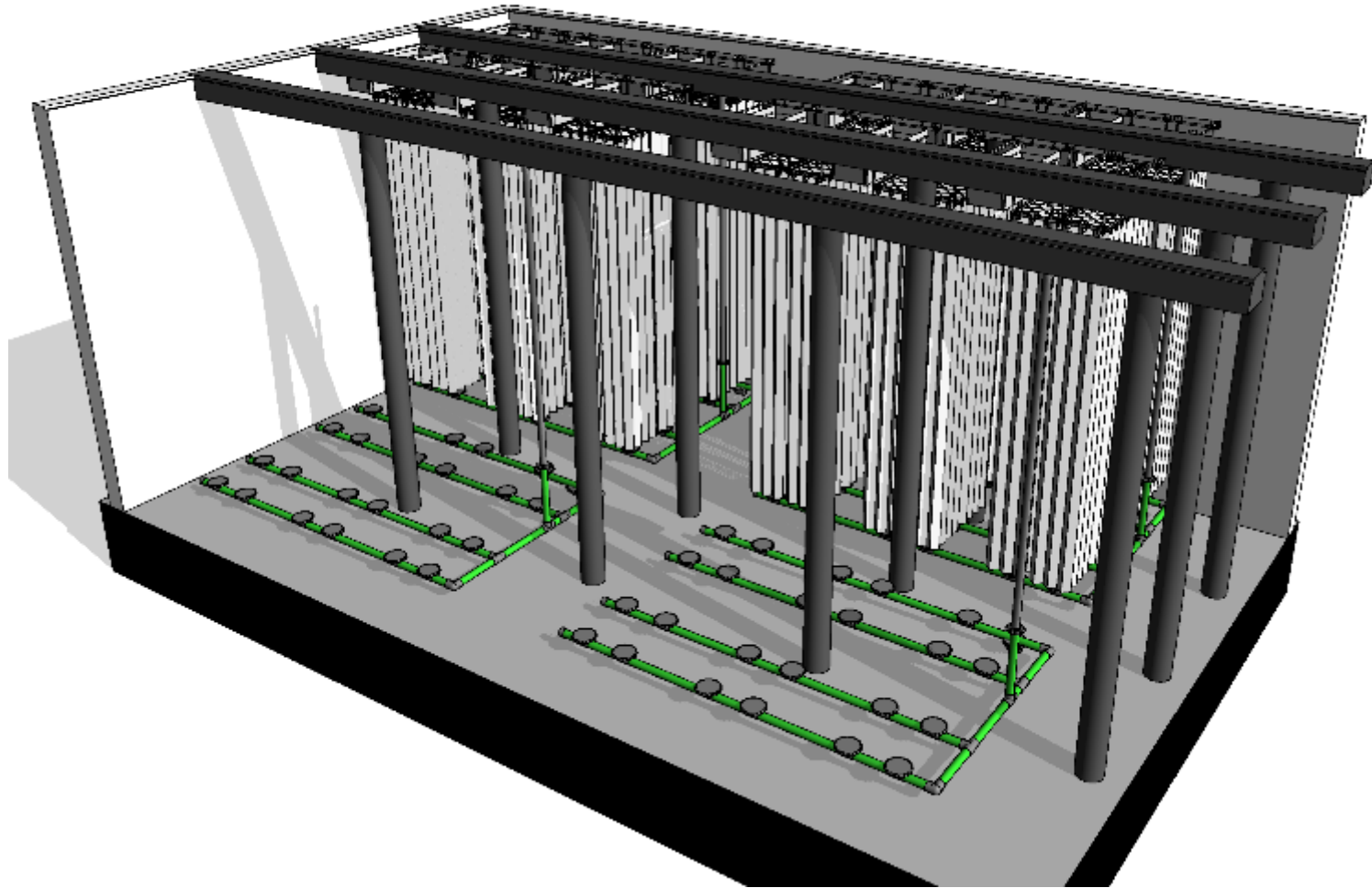
Dividing Walls Create Cascade Reactor Design



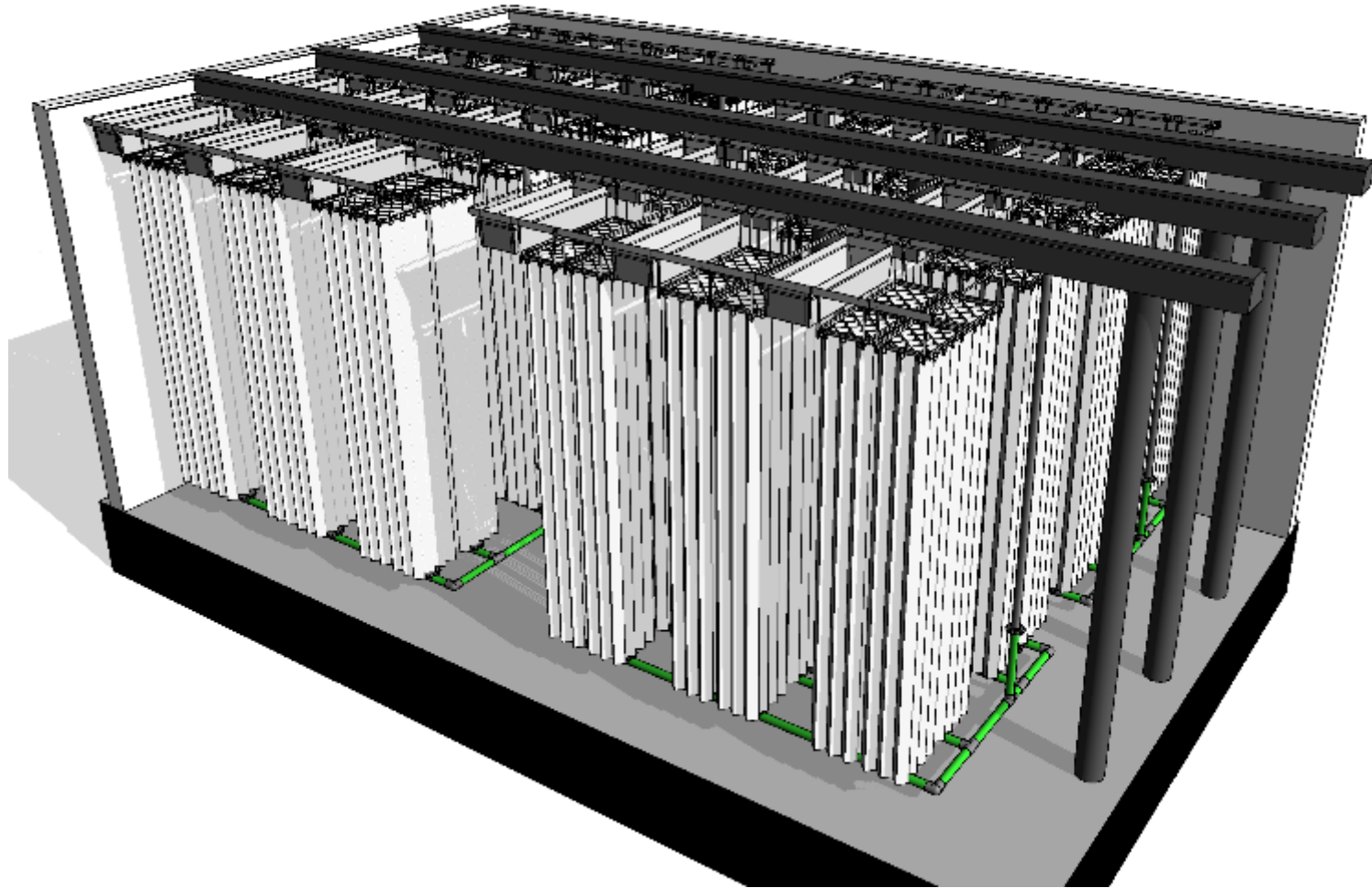
Installation Step 1: Placement Of Aeration Panels Under Carrier Unit



Installation Step 2: Attach Carrier Units To Reactor Walls



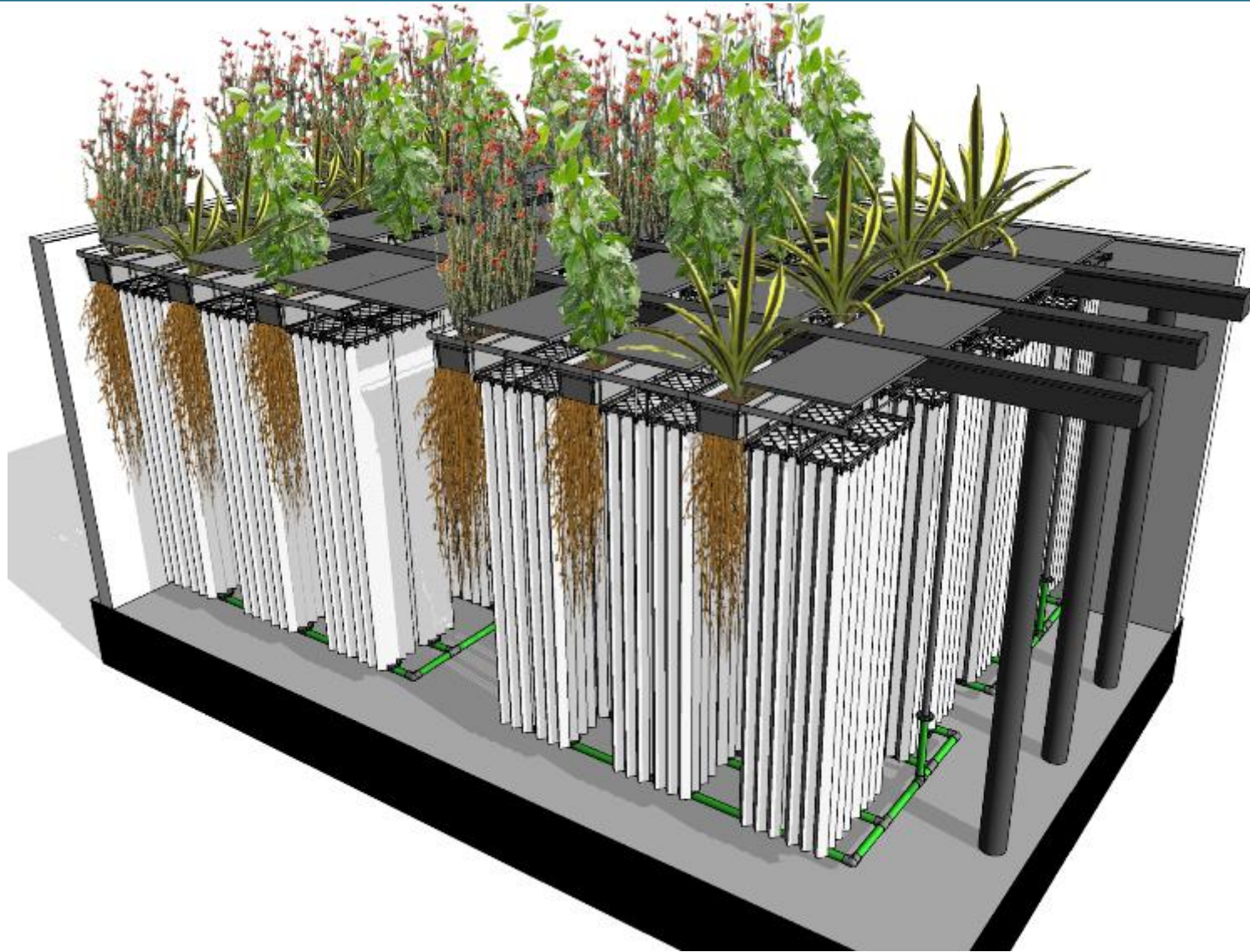
Installation Step 3: Attach Plant Racks To The Cross Beams/Walls



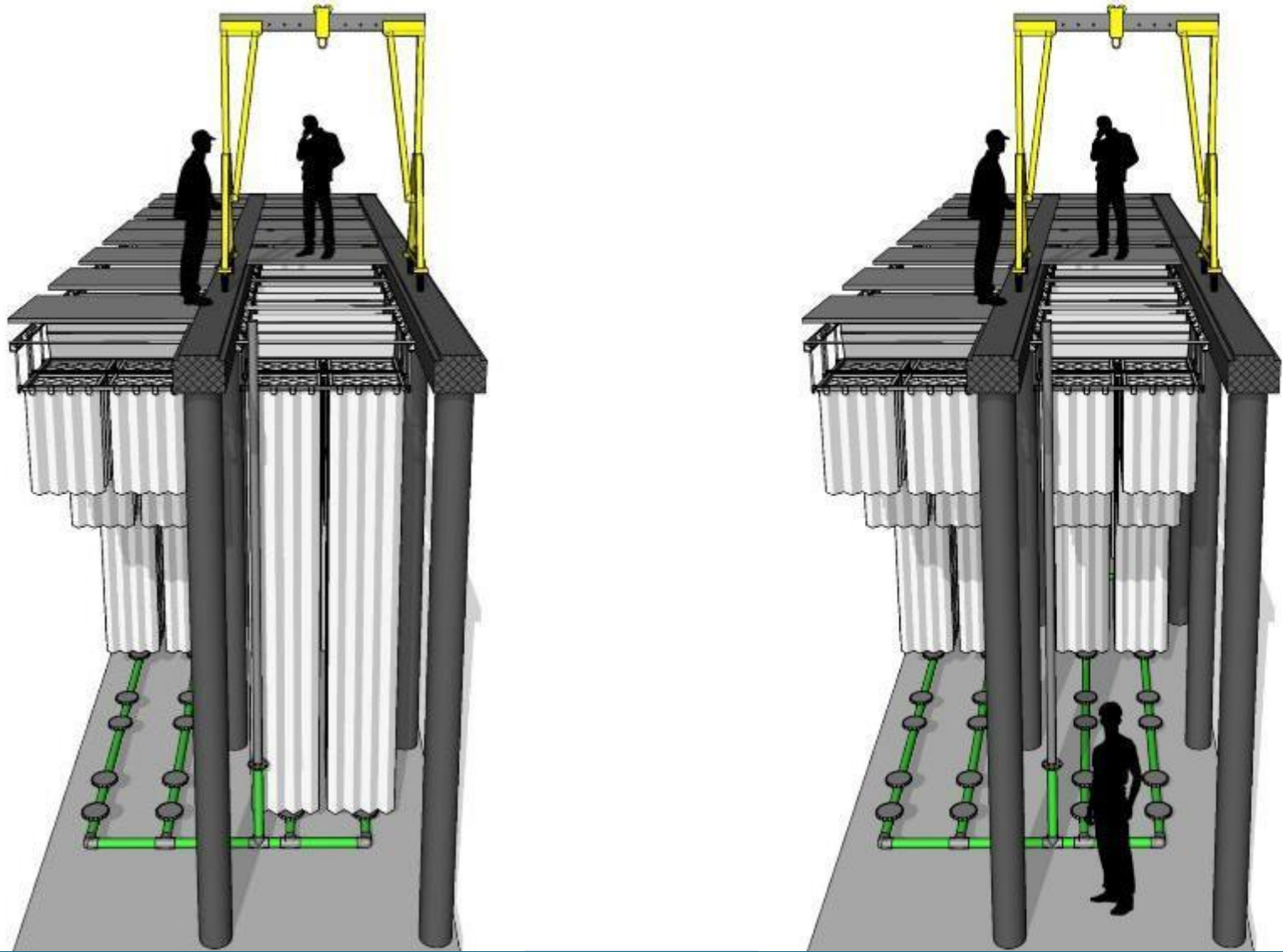
Installation Step 4: Planting Of Local Species Into Plant Racks



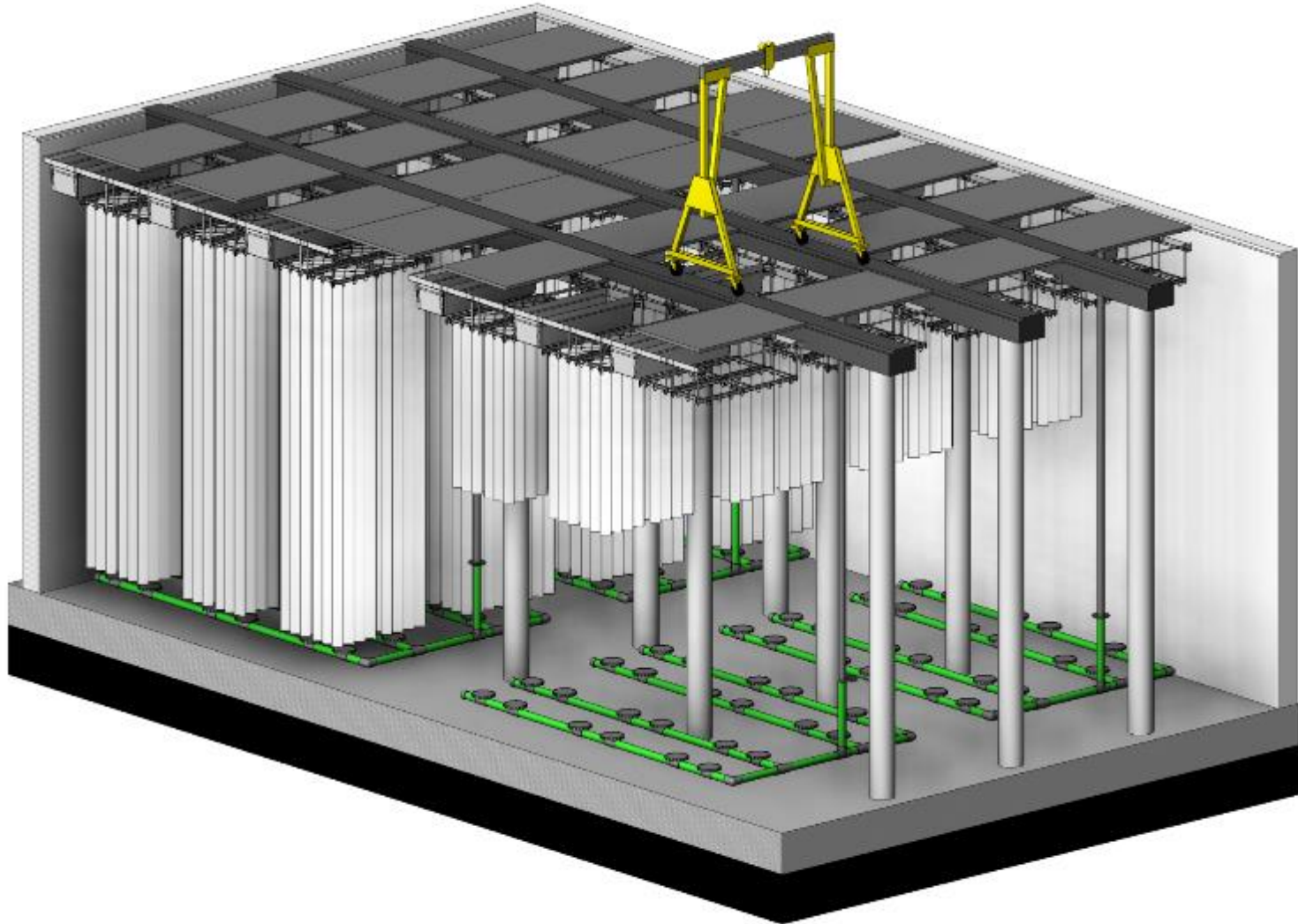
Installation Step 5: Cover Carrier Units While Allowing Easy Access



Design Allows For Easy Access To Biomodule



With Removal Of Biomodule, Aeration Panel Can Be Easily Accessed



Biomodule Is Modular And Designed For Easy Installation And Removal



Biomodule Design Provides Numerous Benefits

Modular design

Matrix structure:
Large surface area for
biofilm to grow



Engineered for easy
operation

Easy to install

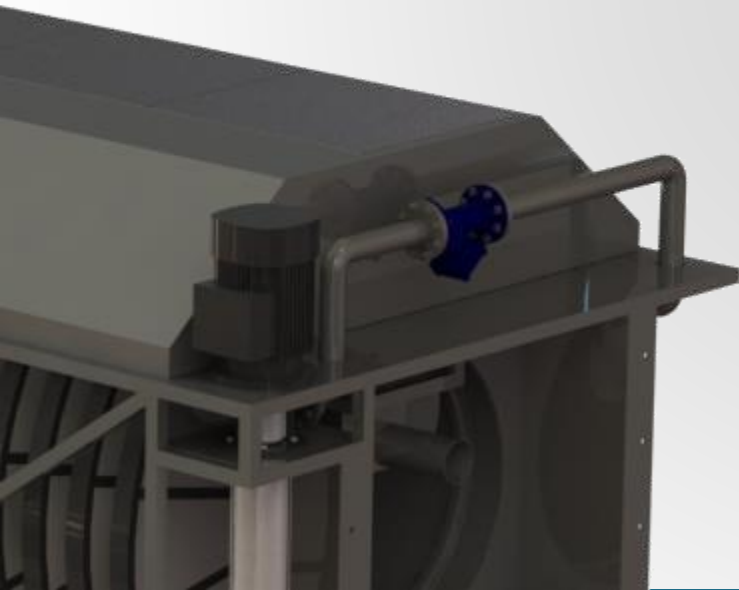
Long lifetime

Disc Filter:

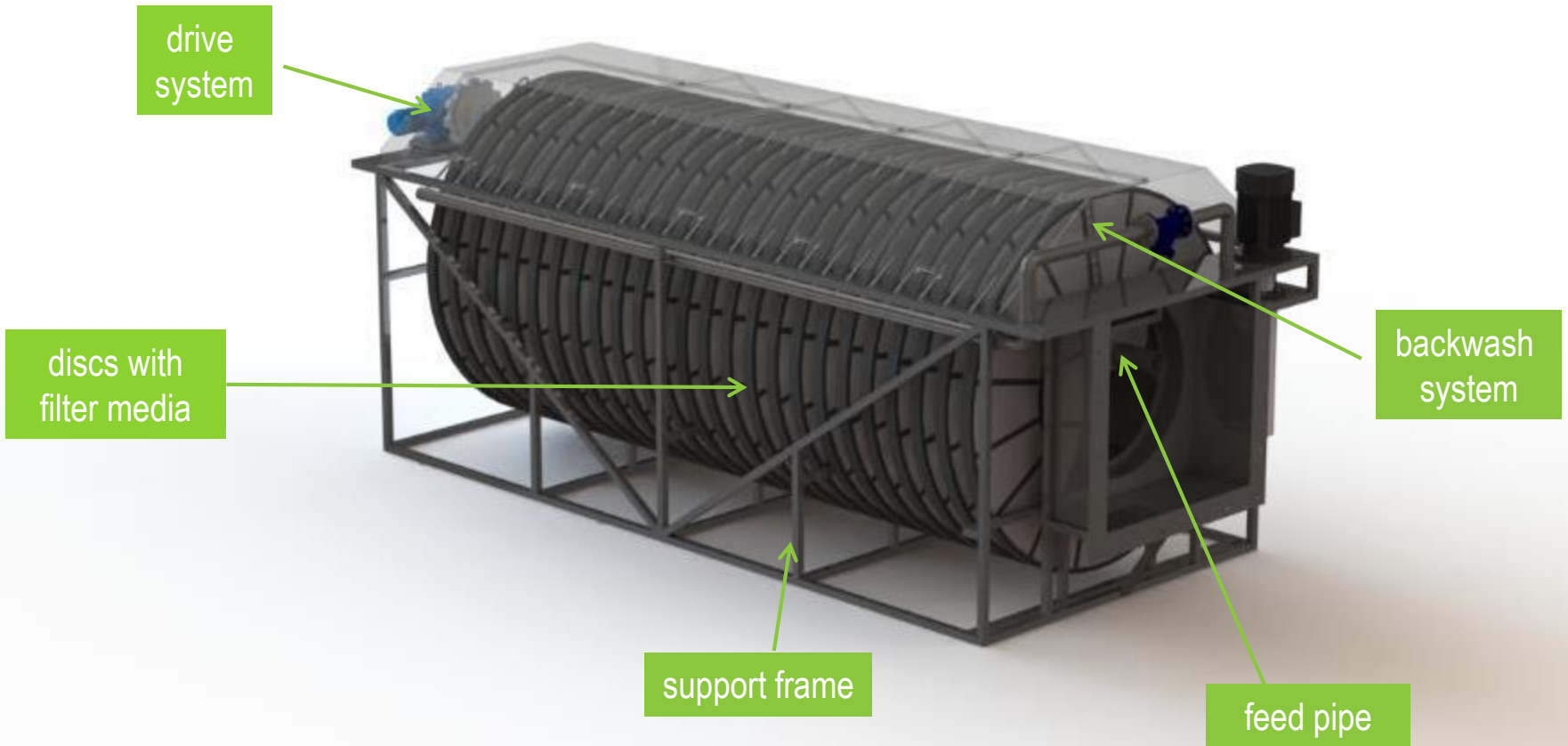
family of mechanical
filtration devices for final
solids separation

Benefits:

- small footprint
- Efficient backwash
- Consistent water quality
- Low operational cost



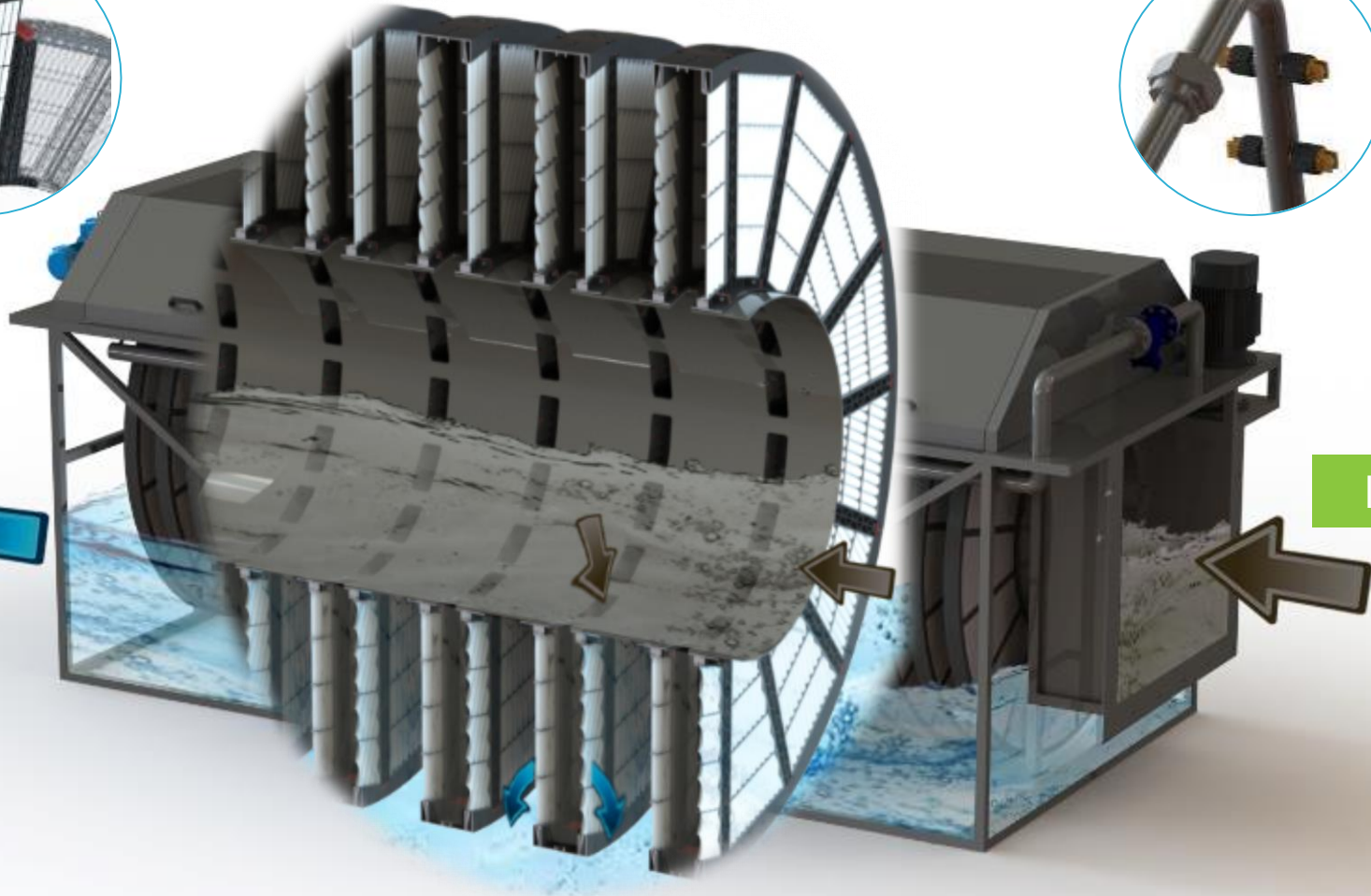
Main Components Of The Disc Filter



Disc Filter Designed For Efficient Flow Patterns



Filtrate



Influent

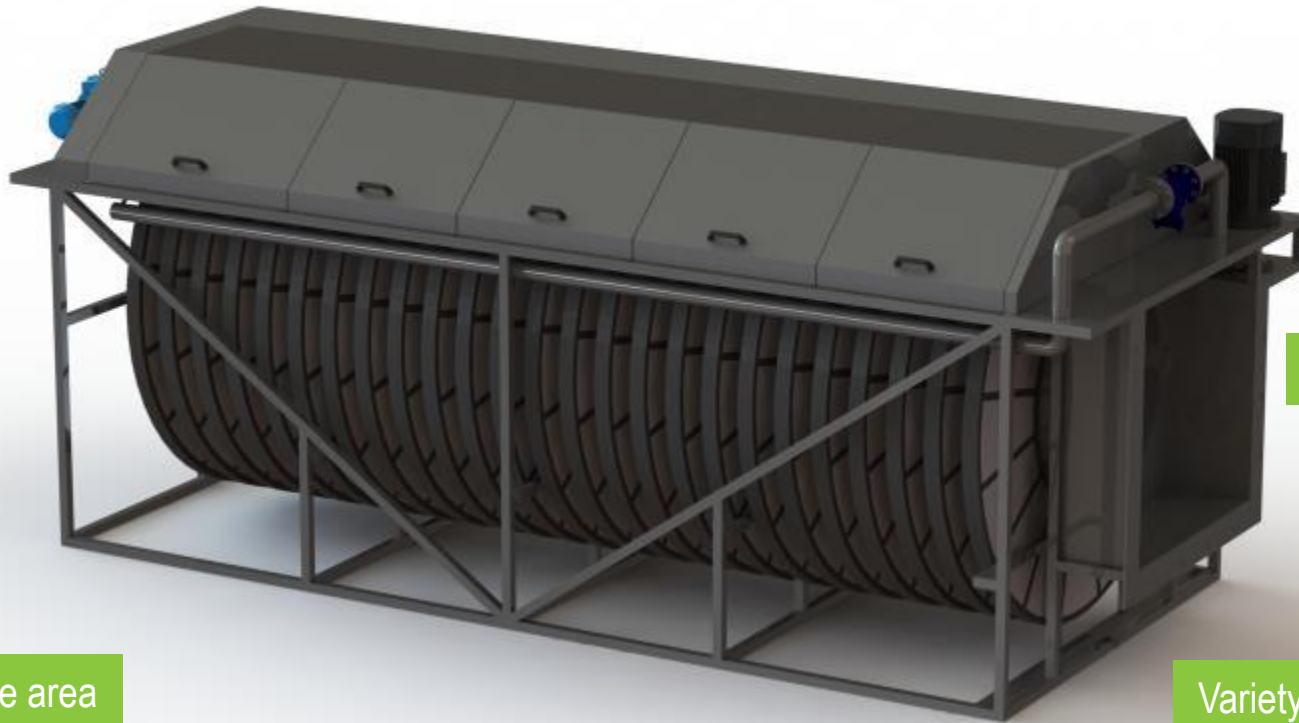


Disc Filter Offers Beneficial Design Features

Small footprint

High flow rate with high
backwash / energy
efficiency

Easy installation



Simple operation

High surface area
filter panels

Variety of filter pore sizes
available to meet project
needs (10-100 μm)

What Is A High-Rate Clarifier?



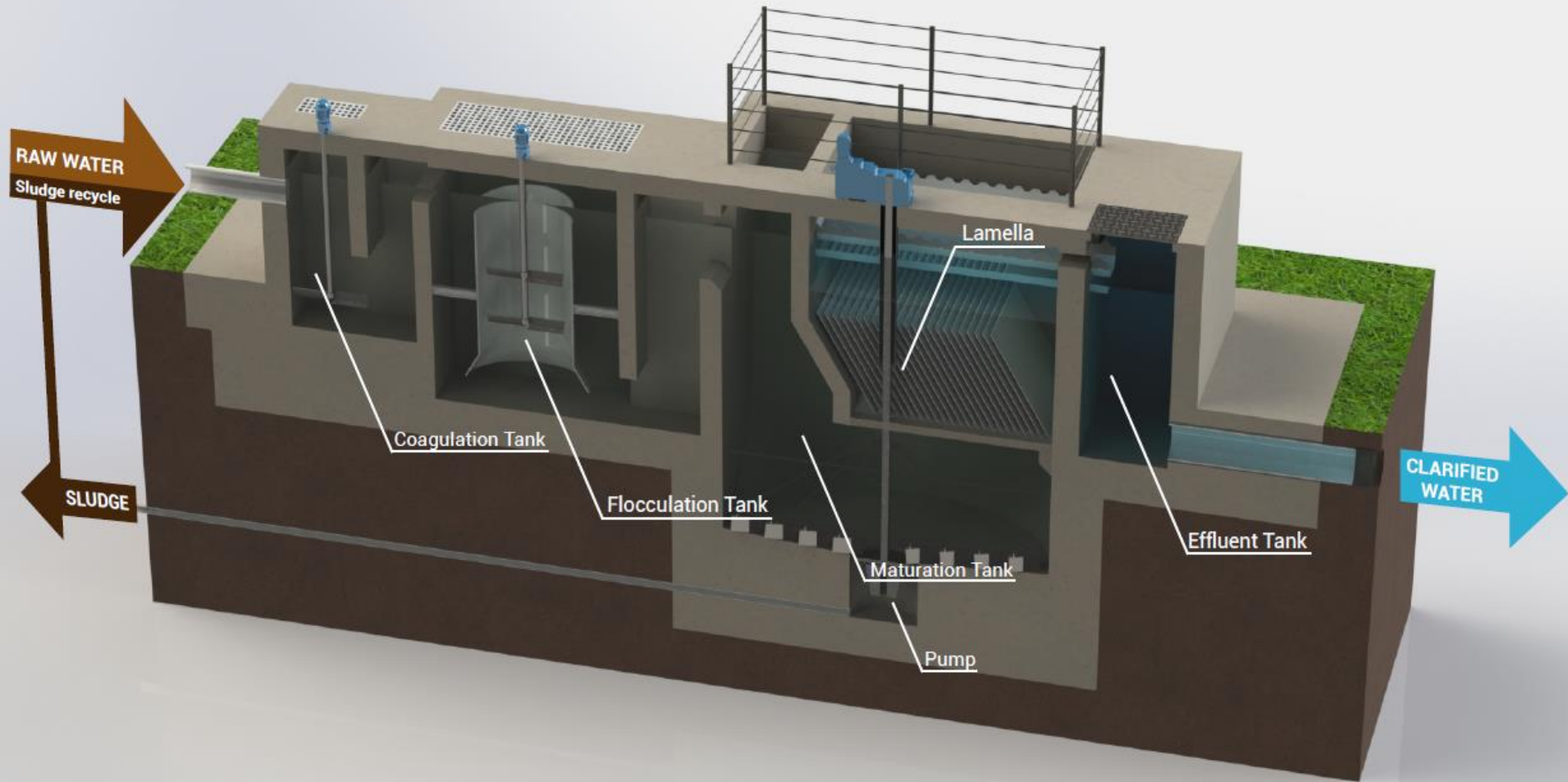
High-Rate Clarifier:

serves as the equivalent of a secondary clarifier in AS systems but requires significantly less footprint.

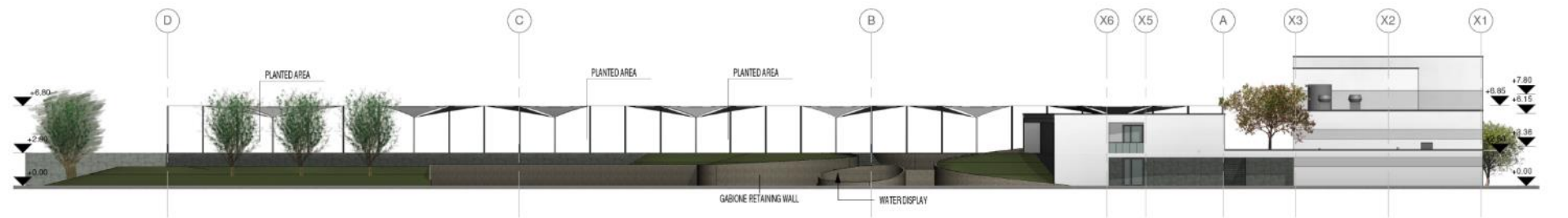
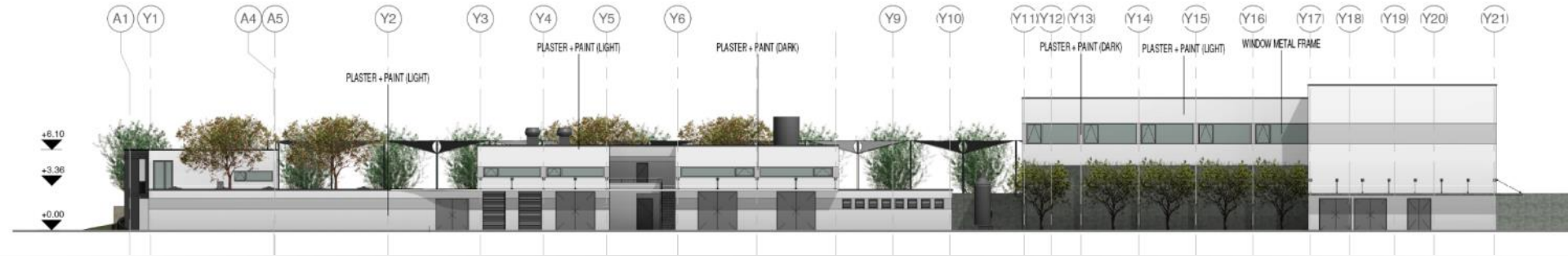
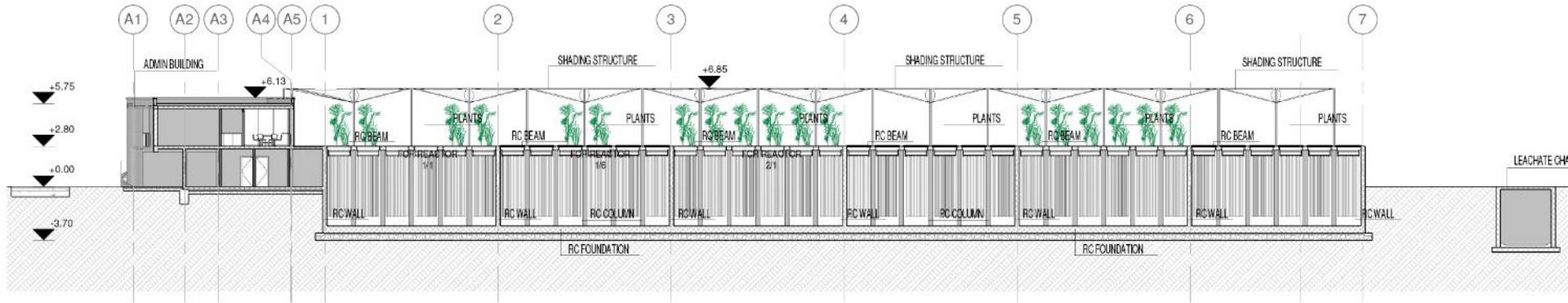
Benefits:

- 1/10th to 1/20th the footprint of a conventional clarifier
- Fully enclosed
- Odor-free operation

Basic operation of the High-Rate Clarifier



Architectural Design – Section Views



Enclosure Options Depend Upon Local Conditions



Creative architectural solutions as shown above are applied for all types of settings, climates, and cultures.

Greenhouse Provides Inexpensive Means Of Creating A Controlled Environment



Urban Integration Based on Local Conditions



Urban Integration Based on Local Conditions

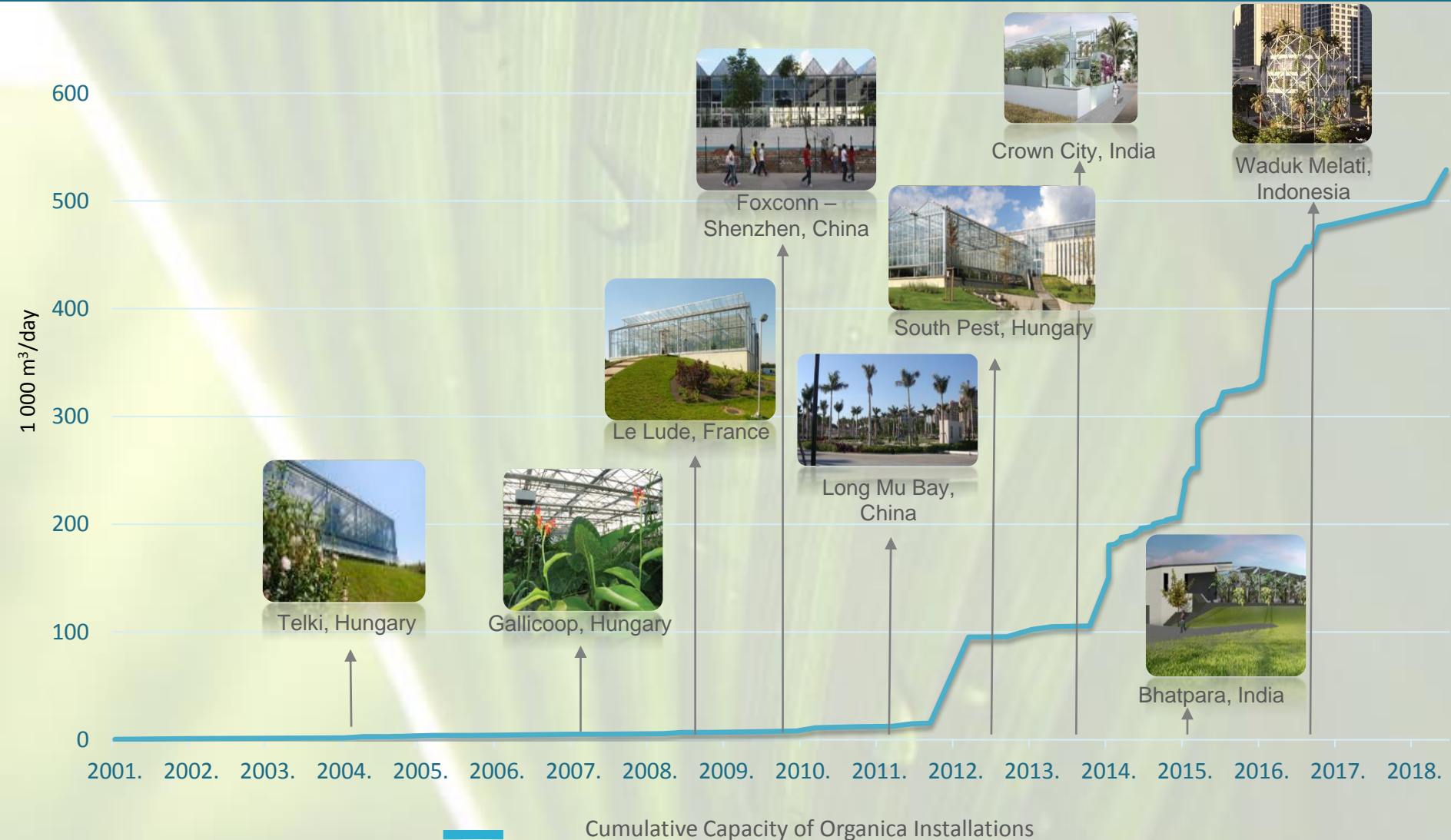




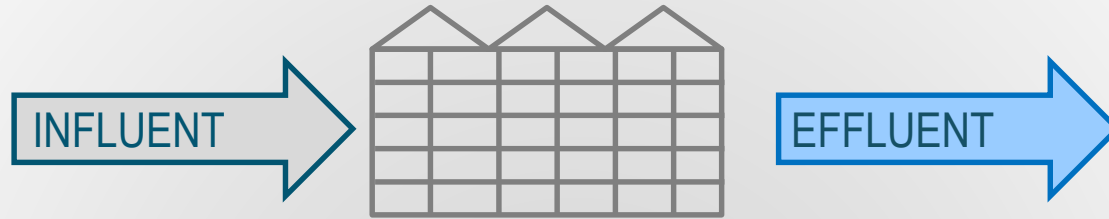
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Organica Applications

Organica Installed Capacity is Growing Rapidly

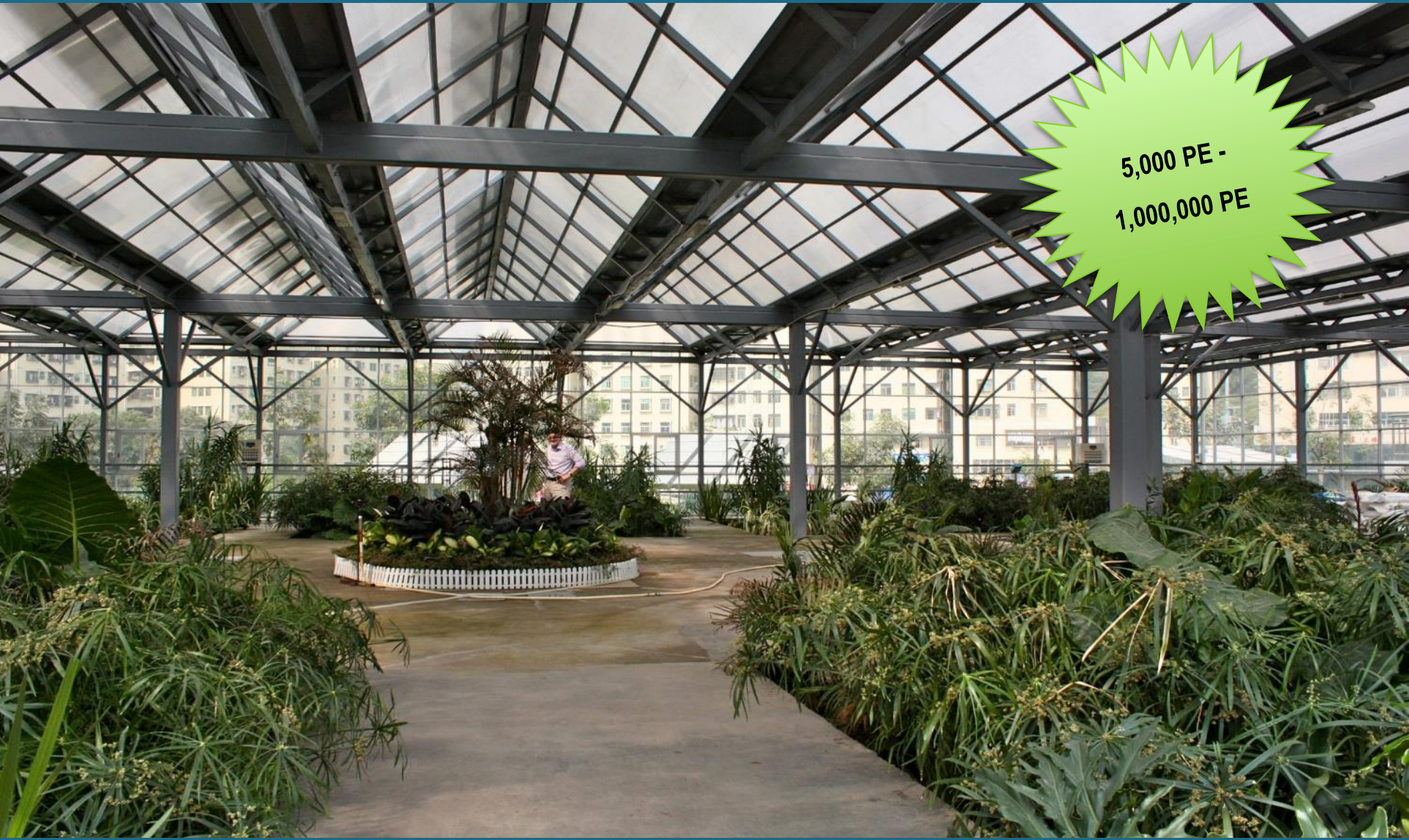


Organica FCR Can Treat A Wide Range Of Influent Conditions To Flexible Discharge Needs



	Influent (mg/l)	Effluent (mg/l)
COD	500-1250	<45
BOD	200-650	<10
TSS	250-800	<10
TN	30-110	<10
Kjeldahl N	30-110	<3
NH4N	90	<0.5
TP	25	<0.5

Organica FCR Systems Are Applicable To A Wide Range Of System Capacities



5,000 PE -
1,000,000 PE

Commercial And Campus Systems Can Engage Local Population



Commercial And Campus Systems Are Visually Attractive And Enhance The Local Environment



Treatment Close To The Source Enables Cost-Effective And Efficient Water Reuse



Industrial Applications

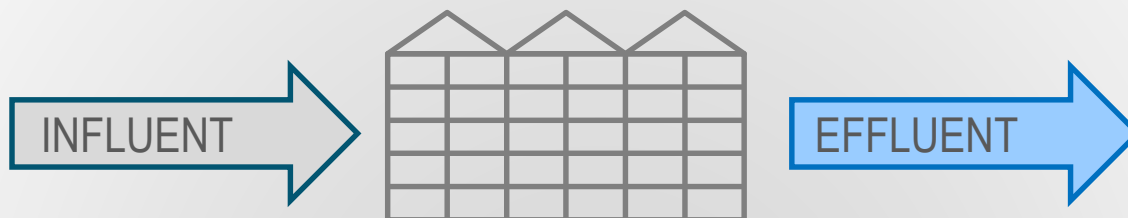


Food Industries

Paper Production

Slaughterhouses

Organica FCR Can Treat A Wide Range Of Industrial Influent Conditions



	Influent (mg/l)	Effluent (mg/l)
COD	12000	<45
BOD	6000	<10
TSS	250	<10
TN	110	<10
Kjeldahl N	110	<3
NH4N	90	<0.5
TP	25	<0.5

Organica FCR Upgrades Can Increase **Both** Capacity **And** Treatment Quality Of Existing Systems





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Sampling Of Organica Projects

Example: Consistent Performance

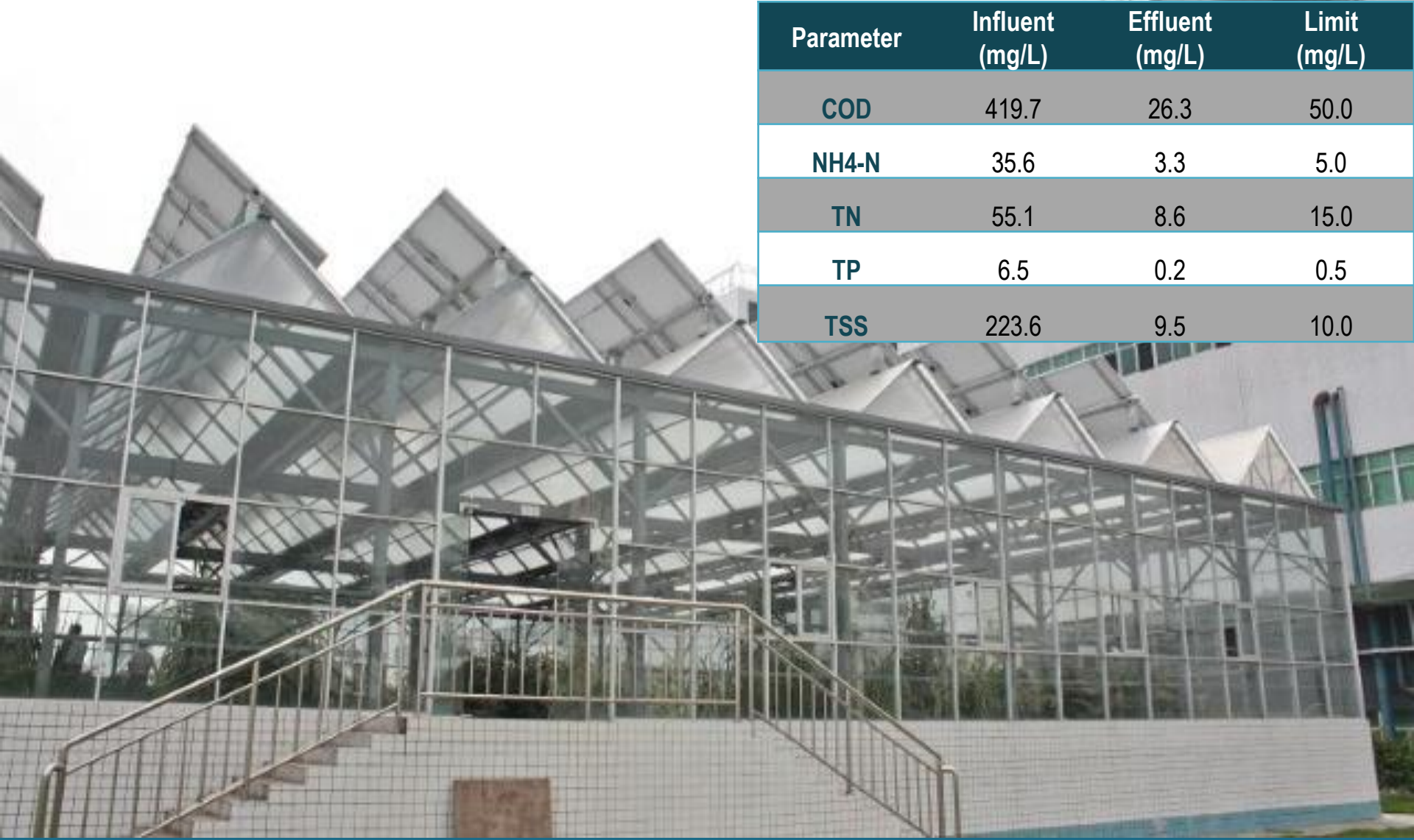
Telki, Hungary – 8 000 PE



Parameter	Influent (mg/L)	Effluent (mg/L)	Limit (mg/L)
COD	890	52	125
BOD	430	9	25
NH4-N	64	3	10
TN	87	10	35
TP	21	1	5
TSS	426	9	35

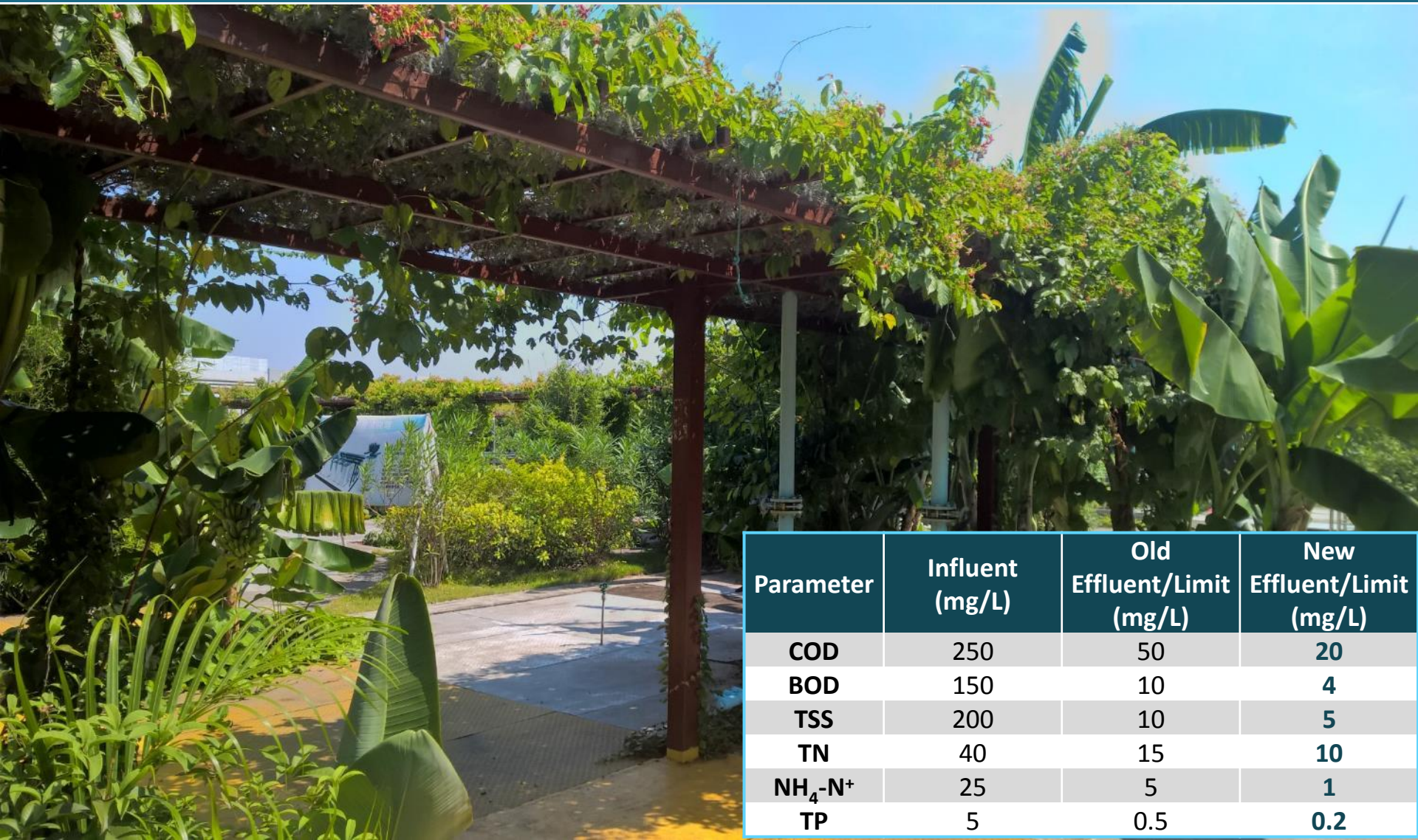
Example: Consistent Performance

Shenzhen, China- 17 000 PE



Parameter	Influent (mg/L)	Effluent (mg/L)	Limit (mg/L)
COD	419.7	26.3	50.0
NH4-N	35.6	3.3	5.0
TN	55.1	8.6	15.0
TP	6.5	0.2	0.5
TSS	223.6	9.5	10.0

Example: Effluent Improvement HeYuan South, China- 200 000 PE



Parameter	Influent (mg/L)	Old Effluent/Limit (mg/L)	New Effluent/Limit (mg/L)
COD	250	50	20
BOD	150	10	4
TSS	200	10	5
TN	40	15	10
NH₄-N⁺	25	5	1
TP	5	0.5	0.2

Example: Operational Cost Savings

Gencay, France – 4 000 PE



Energy	Consumption (kWh/yr)	Annual Cost (€ /yr)
Organica Design Condition	174 258	12 198
Actual Operating Performance	109 677	10 967
Difference between design and actual	- 37%	- 10%

Example: Small footprint, environmental value

Long Mu Bay, China – 40 000 PE



Example: Aesthetically pleasing construction

Aups, France – 9 500 PE



Greenhouse Enclosure

Harbor Park, Hungary – 2 800 PE

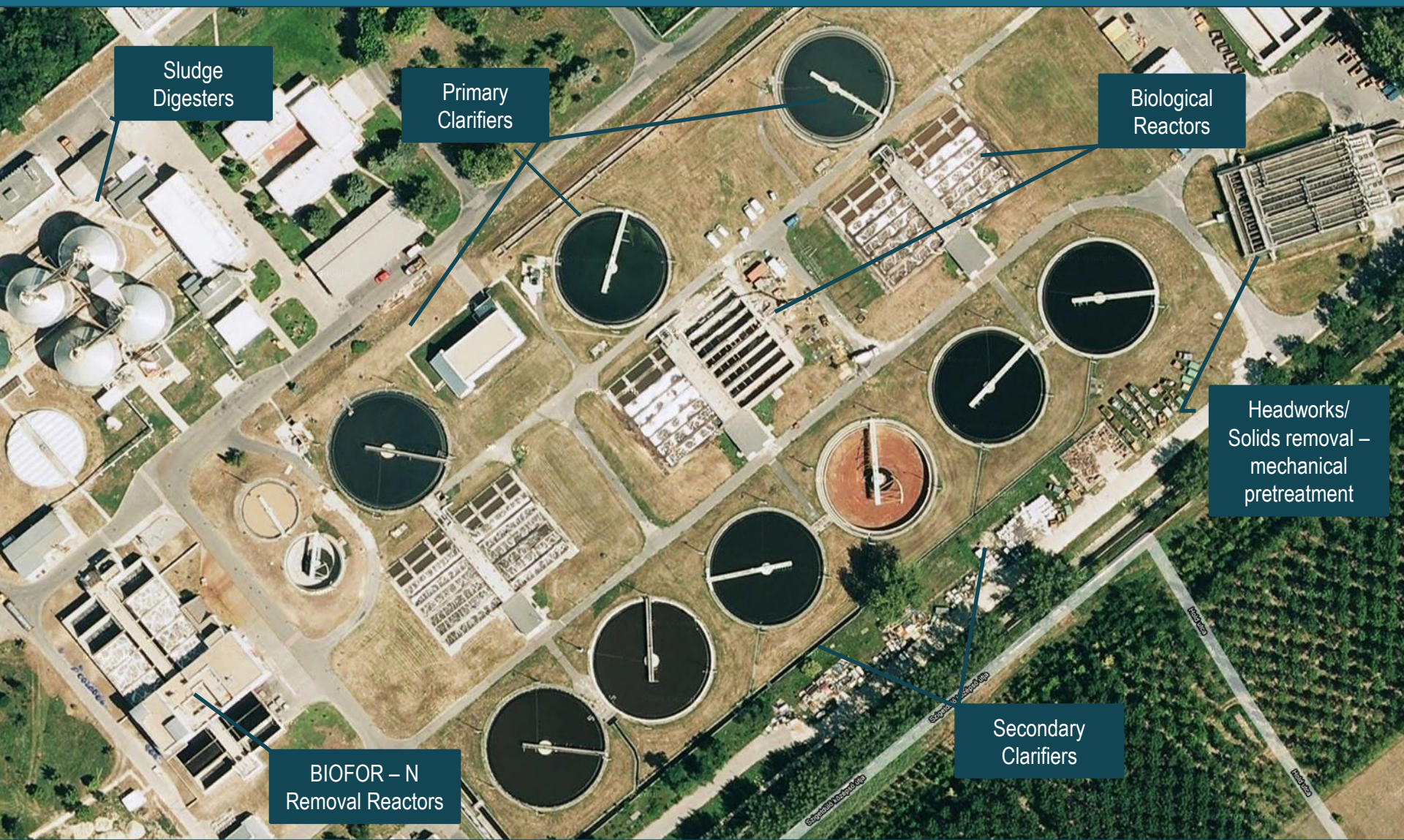




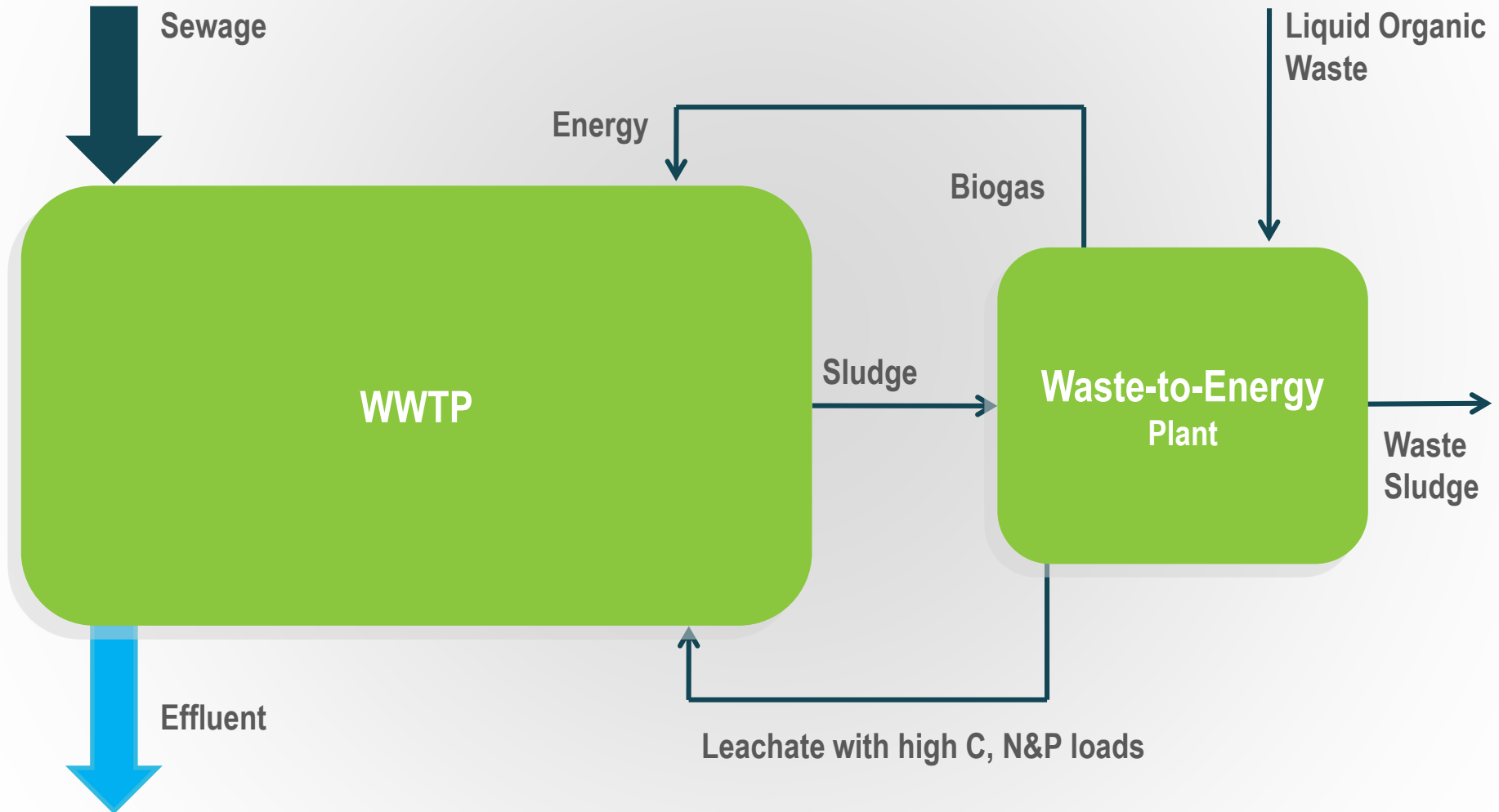
ORGANICA

South Pest FCR Upgrade

South Pest Upgrade Treats 80 000 m³/day



South Pest Simplified Process Scheme



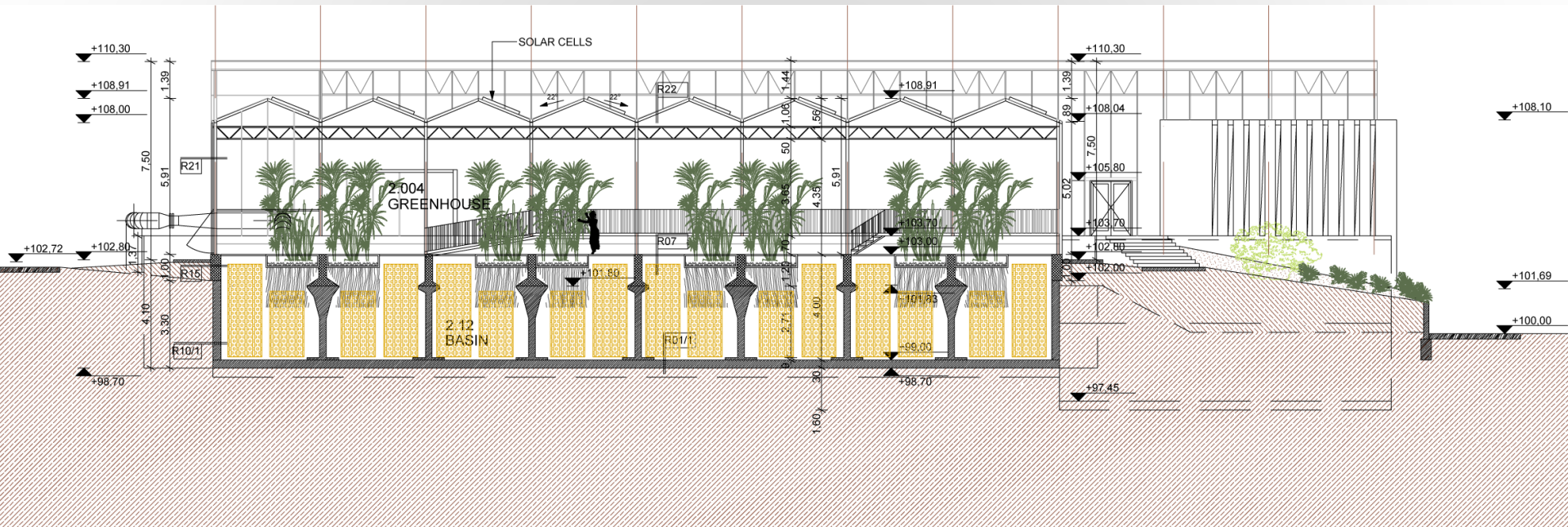
South Pest Operational Problems



Organica FCR Upgrade Into Existing Aeration Basins



Organica FCR Upgrade Utilizing Existing Concrete Infrastructure



Installation Of Biomodules



Installation Of Biomodules



Installation Of Biomodules



Organica FCR Upgrade Solution Improved Performance Of Both Biological And Clarifier Processes



	Old	New	% Change
Reactor Height (m)	2.7	3.5	+ 30
Reactor Volume (m ³)	9 085	11 700	+ 30
Biomass Concentration (kg/m ³)	2.5	7.8	+ 212
Total Biomass (Ton)	22.5	91.3	+ 305
Clarifier Loading TSS (mg/L)	2500	<300	- 88

Before & After: Organica FCR Upgrade At South Pest



Transformation of Activated Sludge to Organica FCR

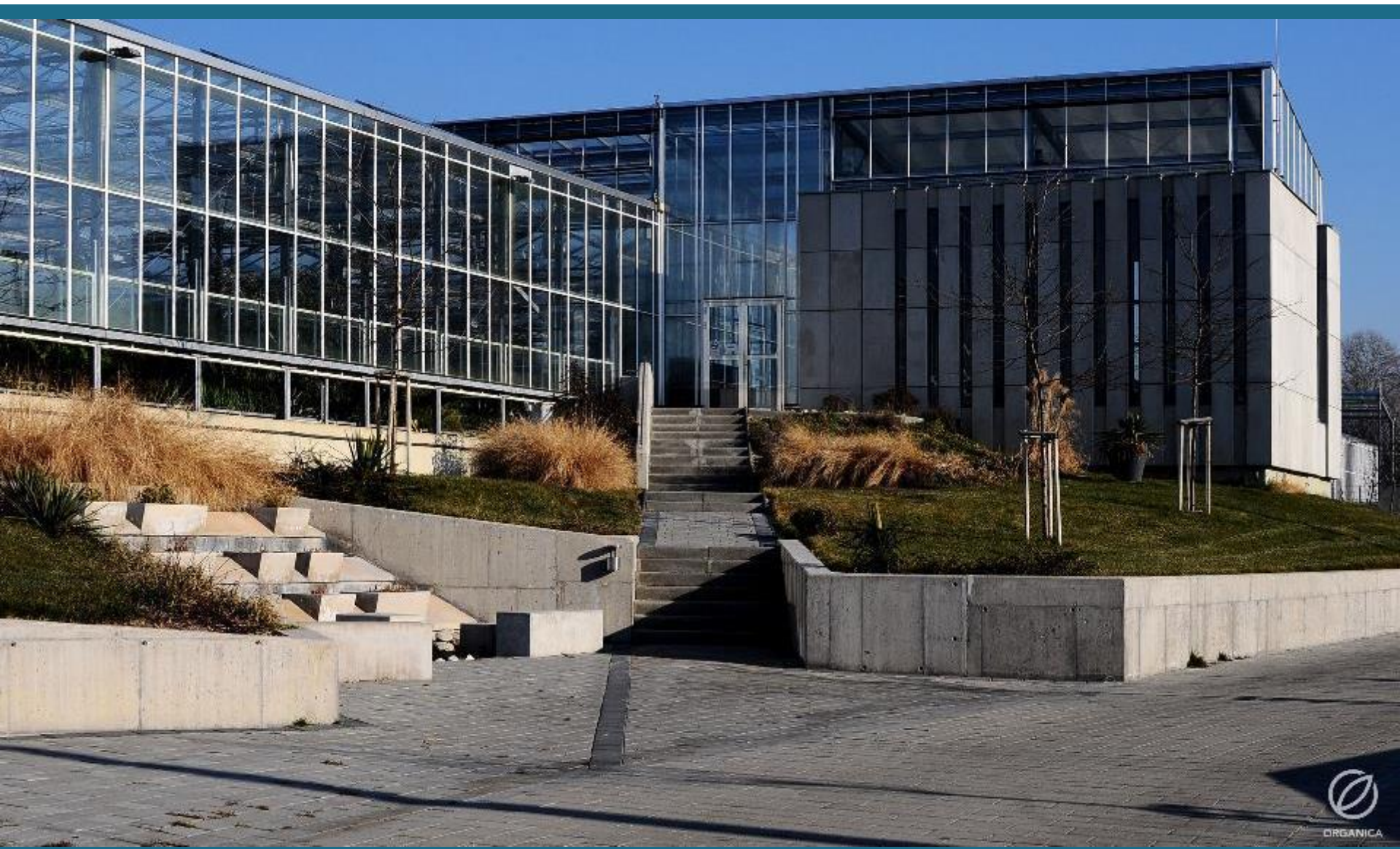


Before – concrete activated sludge reactors



After - upgrade with Organica FCR

Aeration Basin Exterior – As Built



Aeration Basin Greenhouse Interior



What is Bluehouse?

- Complete & sustainable solution for smaller-capacity applications
- Pre-designed and assembled for easy installation
- Perfect solution for small communities, real estate development projects, hotels, or resorts, as well as for industrial and light commercial purposes
- ***NOT intended to be the lowest COST solution***



Technical Parameters		Typical Effluent Parameters	Limit (mg/L)
Capacity	310 – 4,000 PE	COD	50
	62 – 800 m ³ /day	BOD	10
	16,000 – 211,000 gal/day	TN	15
Footprint	Fits on a site as small as 60 m ² (650 ft ²)	NH ₄ -N	5
		TSS	10
		TP	1

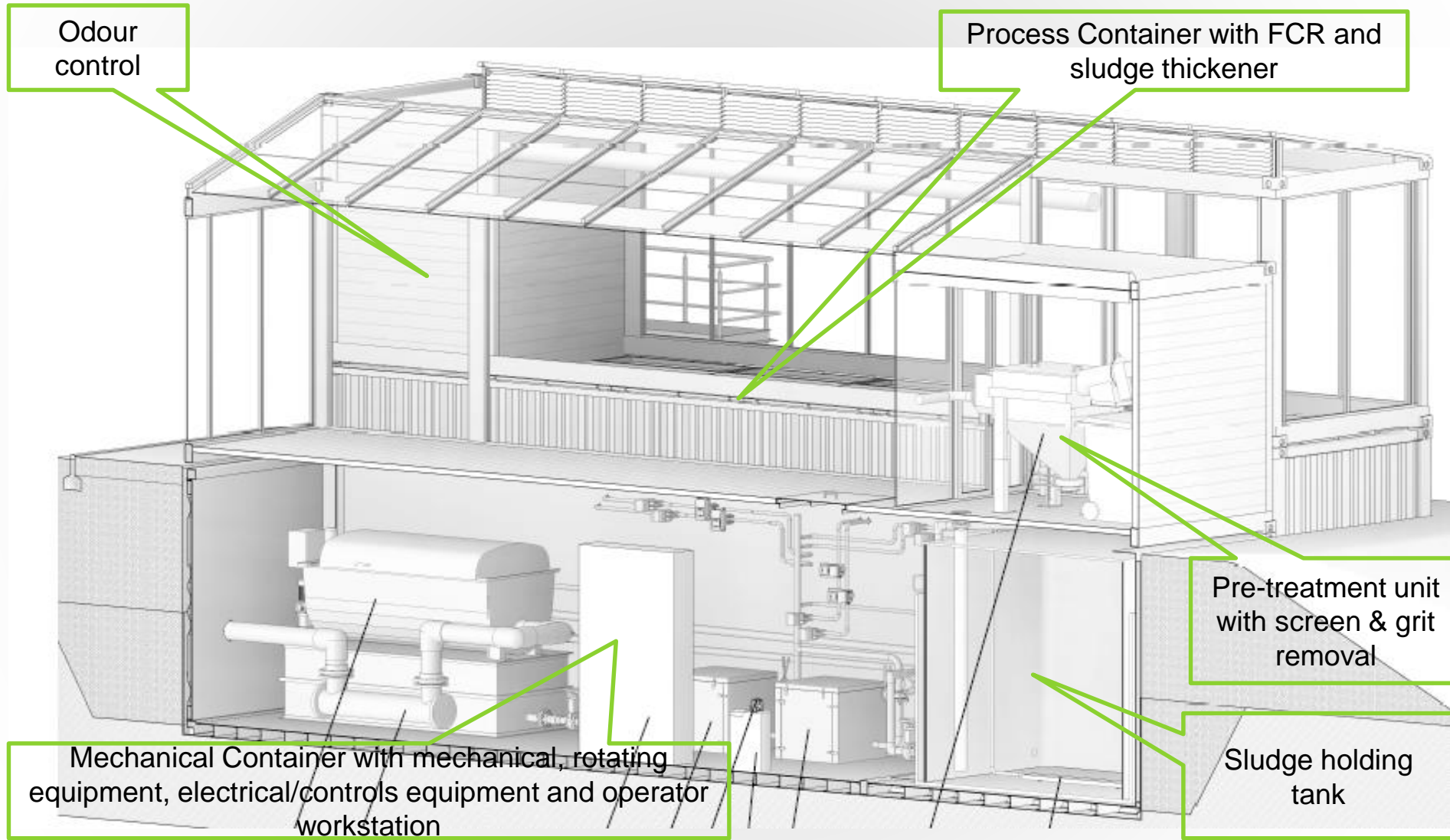
Organica Bluehouse Applications & Advantages

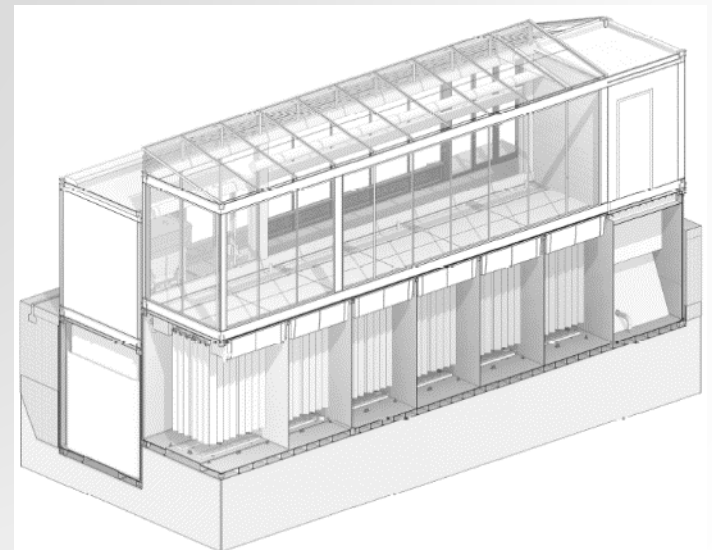
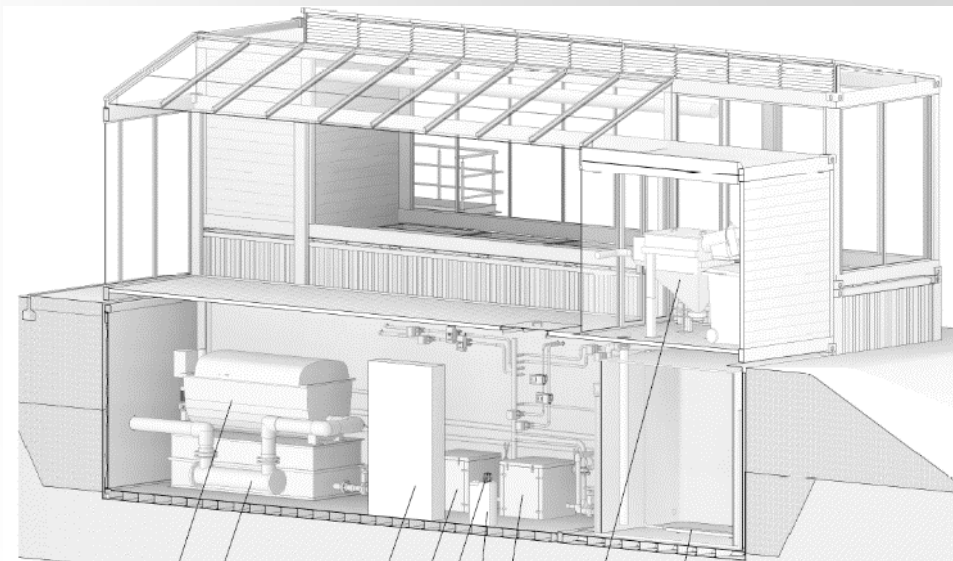


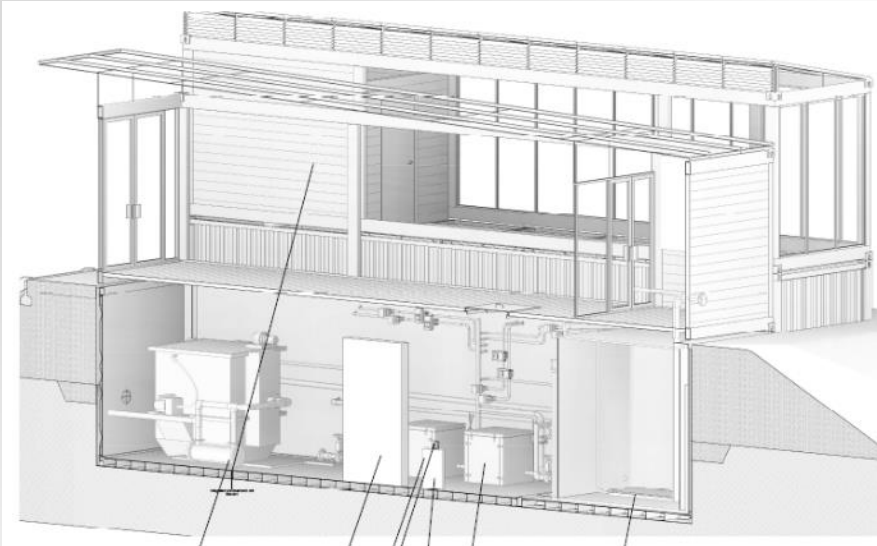
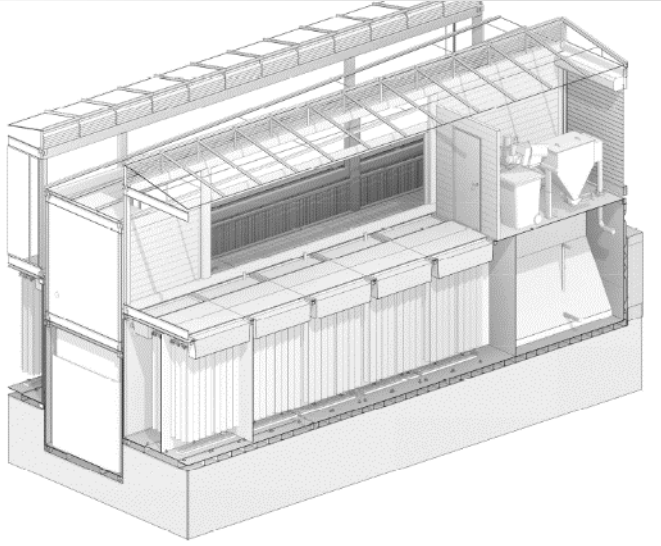
- True Organica solution: **odourless** operation
- **attractive** appearance with **compact** physical footprint
- Pre-designed to allow **rapid manufacturing** and delivery
- Factory-assembled for **easy installation** with minimal site work
- Reliable and **simple to operate** with low staffing needs
- **Reuse quality effluent**, which may be used for irrigation, cooling towers, and for other non-potable purposes
- **Onsite treatment** eliminates need for sewage network connection
- **Preserves land value** by reducing “psychological” footprint



Cross Section of an Organica Bluehouse







Vision of the Future – Water Reclamation Gardens





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