



ORGANICA

# ORGANICA

Treating, Conserving,  
and Recycling Wastewater



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Hotline: 024 66756815

# 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



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# Traditional Activated Sludge: Large Geographic And “Psychological” Footprint



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# What makes Organica Unique?



Wastewater Engineering

+

Architecture

=

A New Way of Thinking

# The Alternative: Organica FCR – Improved IFAS Solution



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# The Alternative: Organica FCR– Improved IFAS Solution



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



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# The Alternative: WWT In The Urban Environment

## Silver Star (Shenzhen), China – 1 700 PE



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# The Alternative: WWT In The Urban Environment

## Foxconn, China – 17 000 PE



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# Example: Localization & Enhanced Land Value Canada, Sechelt – 4 000 m<sup>3</sup>/d Total Capacity



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# The Organica FCR Solution

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# 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 /m<sup>3</sup>

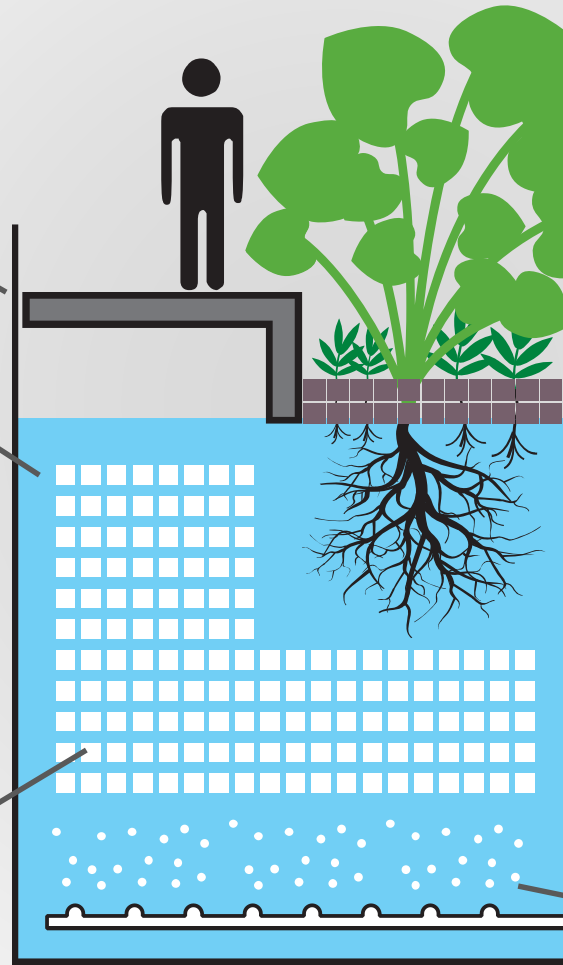
Engineered supporting media

Plants on the supporting mesh

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

3000+ species

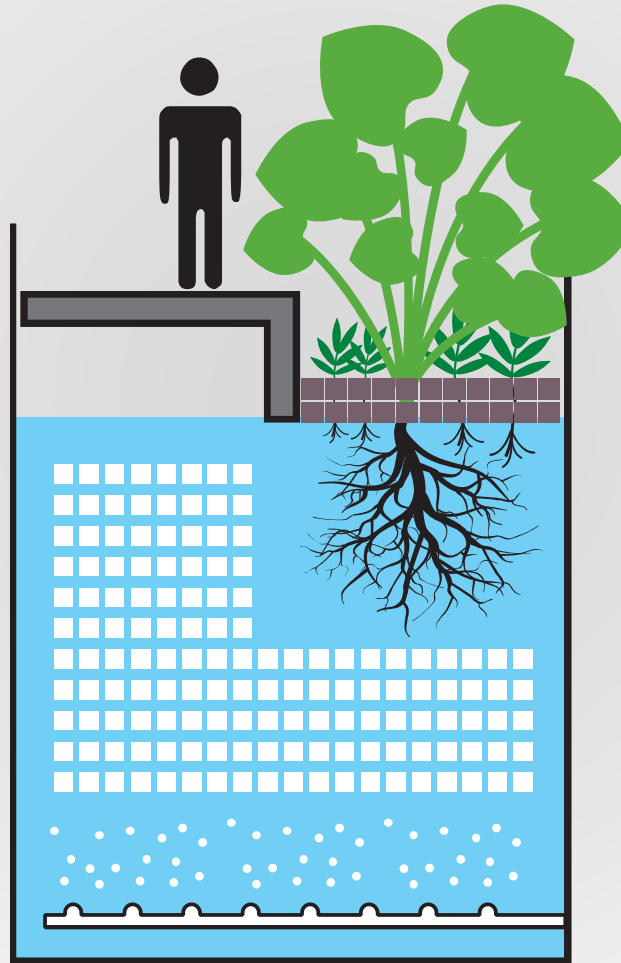
Fine bubble aeration



# Organica FCR: More Hungry Mouths Per Cubic Meter

3000 + species

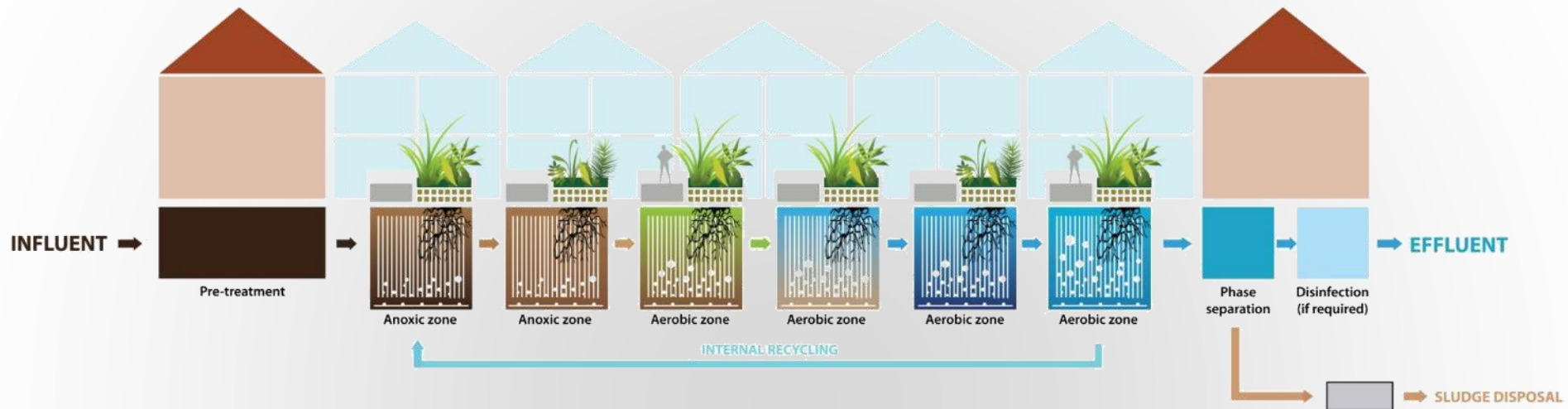
12-18 kg of  
biomass /m<sup>3</sup>



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



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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.

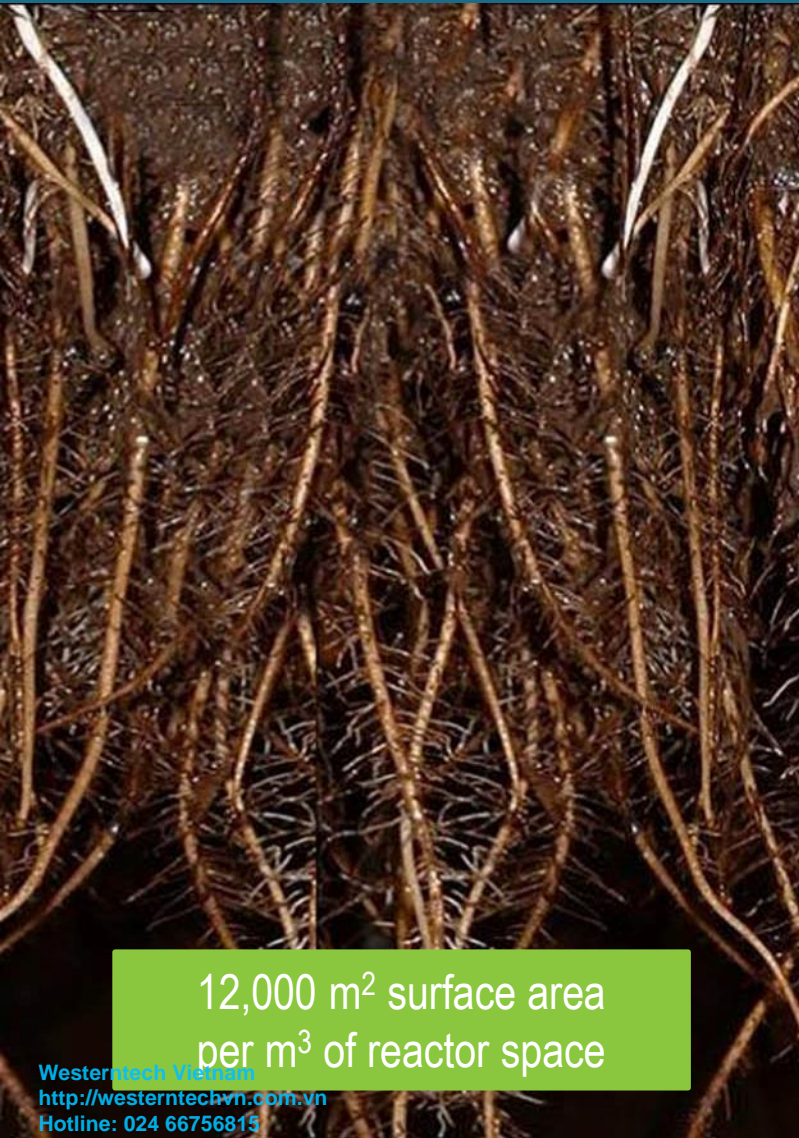


# Plants in Organica FCR



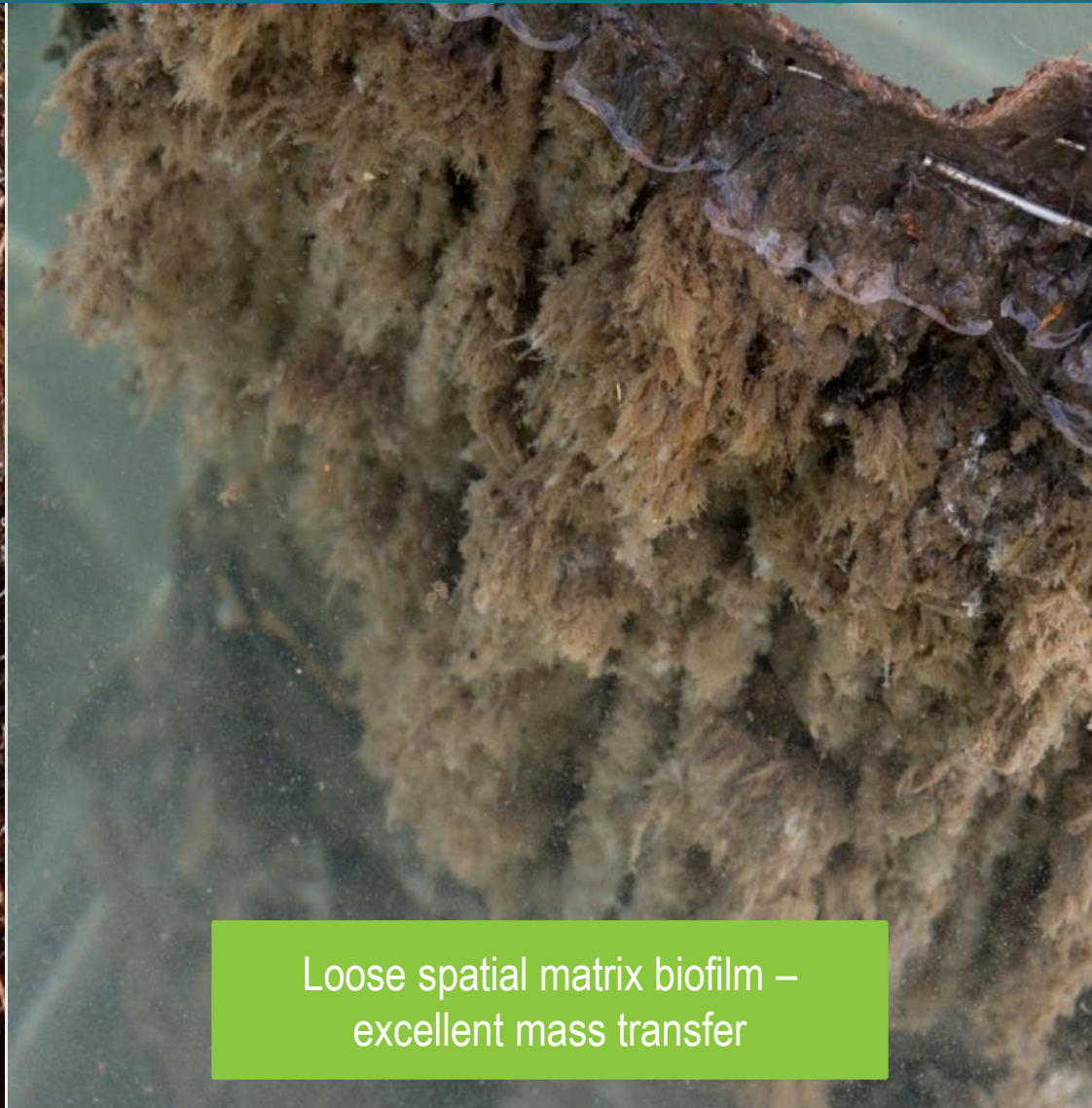
Plants are selected for their root structure, root mass and their ability to withstand the conditions in various reactors. Only locally available species are used, plants are never transported across borders. Plant maintenance comprises of simple gardening practices that can be performed by ordinary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

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



12,000 m<sup>2</sup> surface area  
per m<sup>3</sup> of reactor space

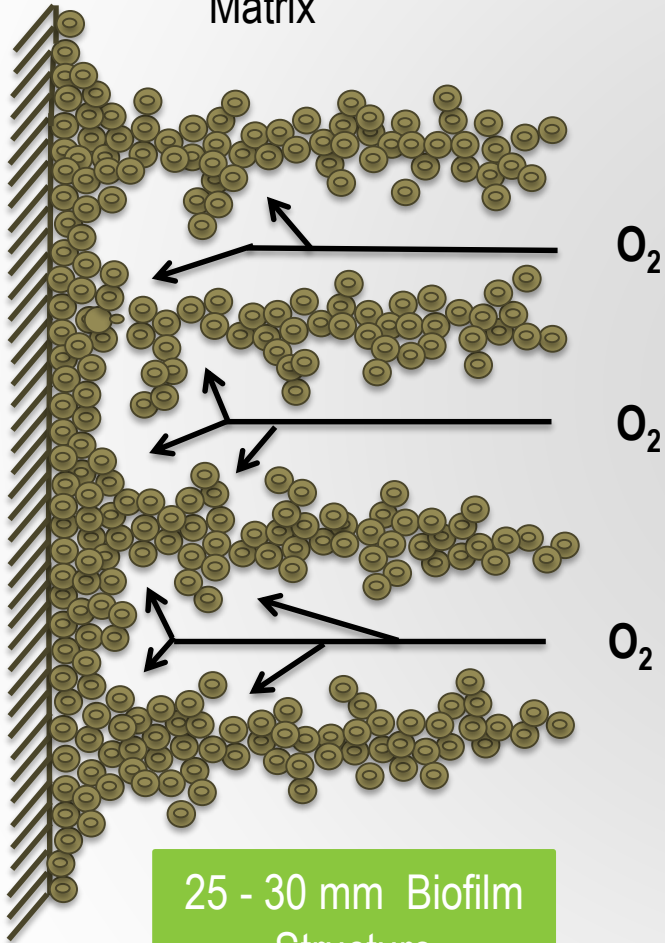
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Loose spatial matrix biofilm –  
excellent mass transfer

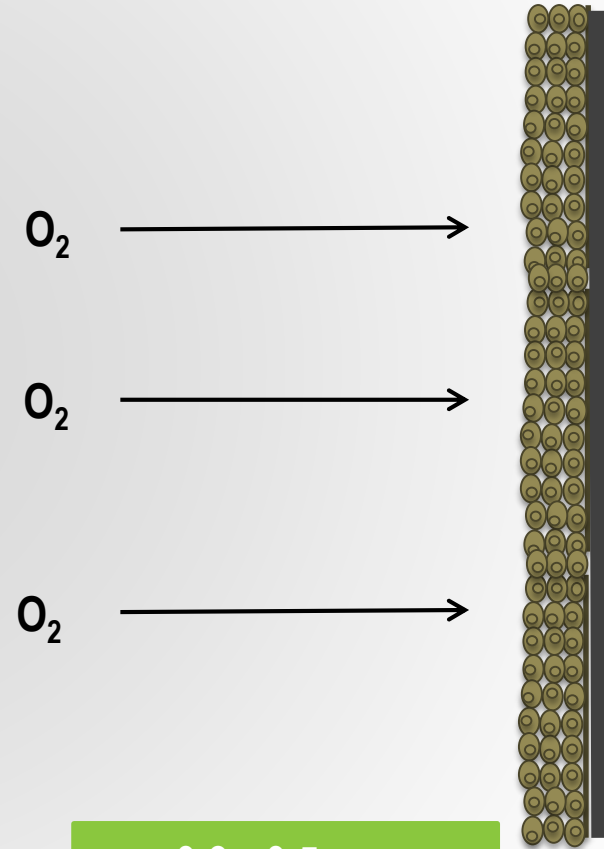
# FCR Spatial Matrix Provides Improved Mass Transfer Efficiency

### FCR Biofilm Loose Spatial Matrix



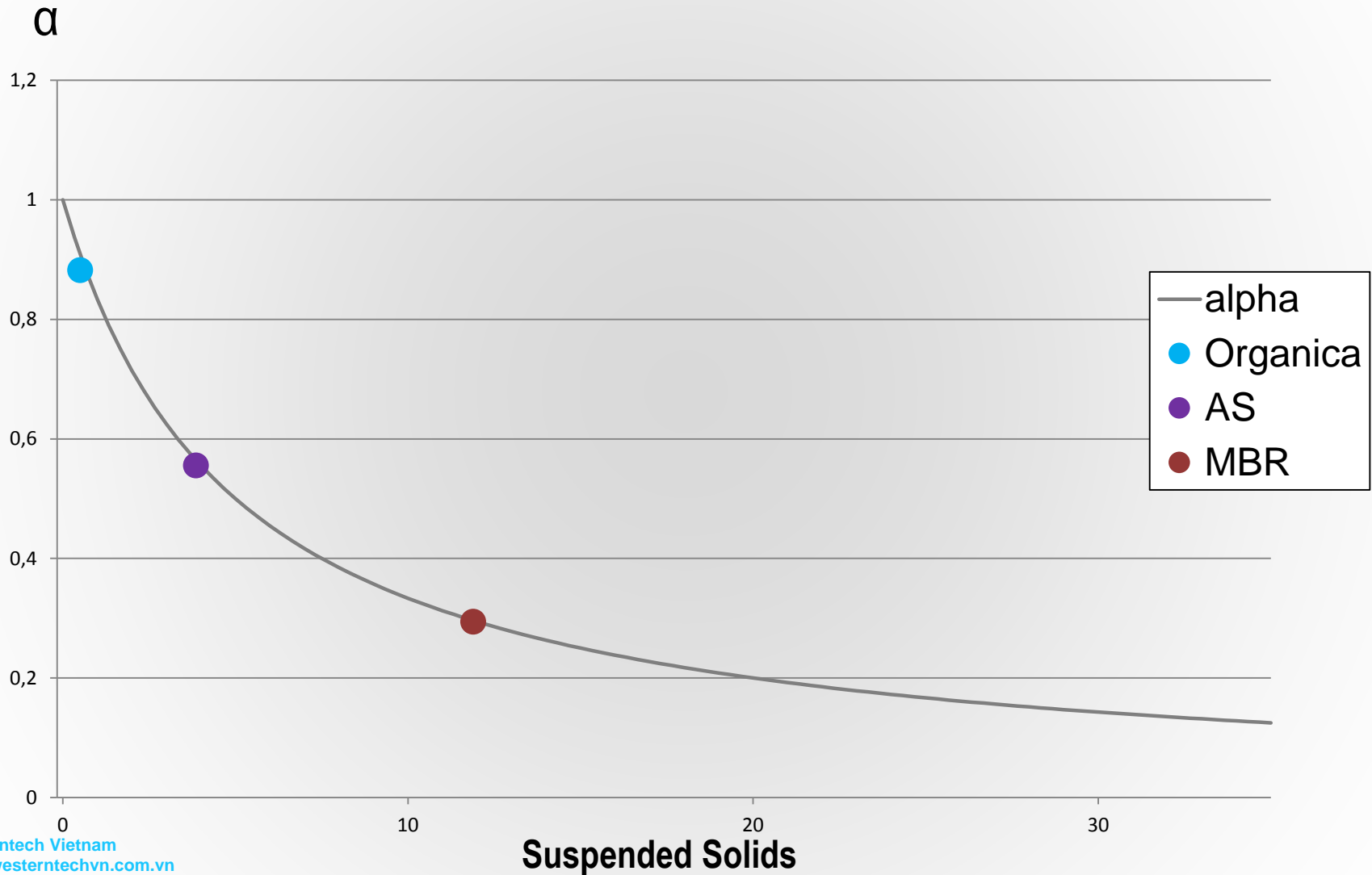
25 - 30 mm Biofilm Structure

### Conventional Fixed Film Biofilm Structure

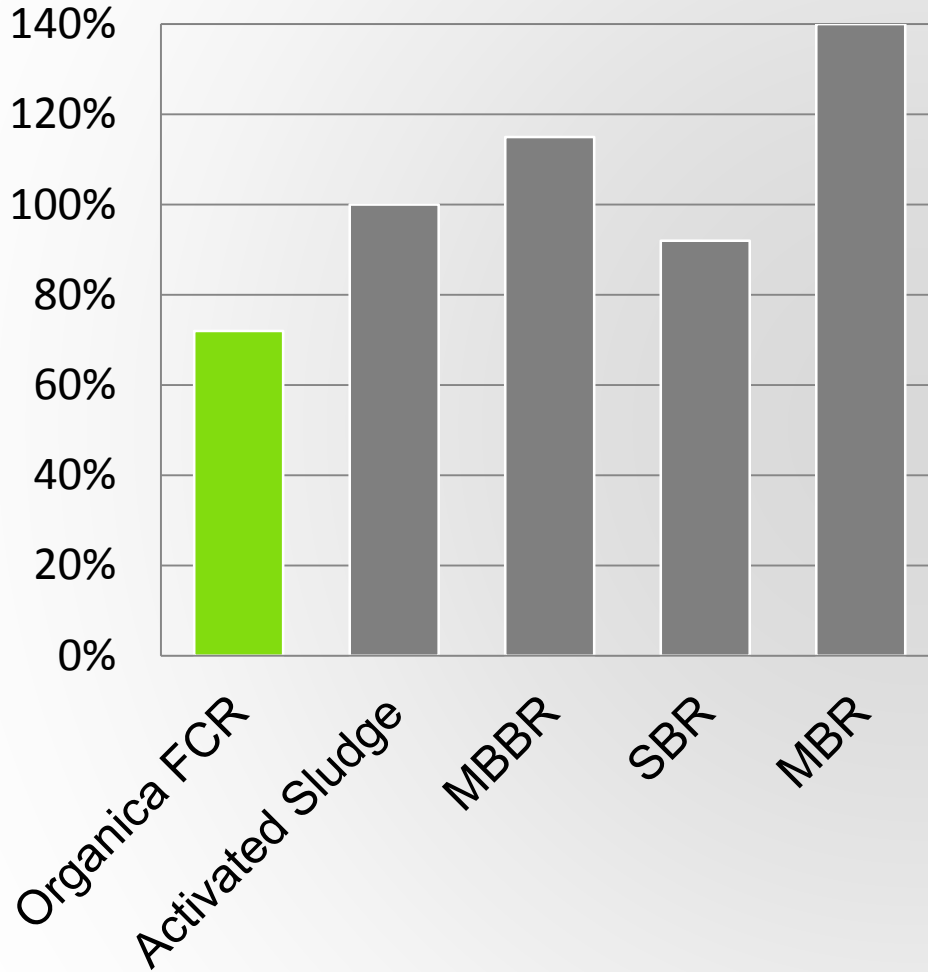


0.3 - 0.5 mm Biofilm Thickness

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



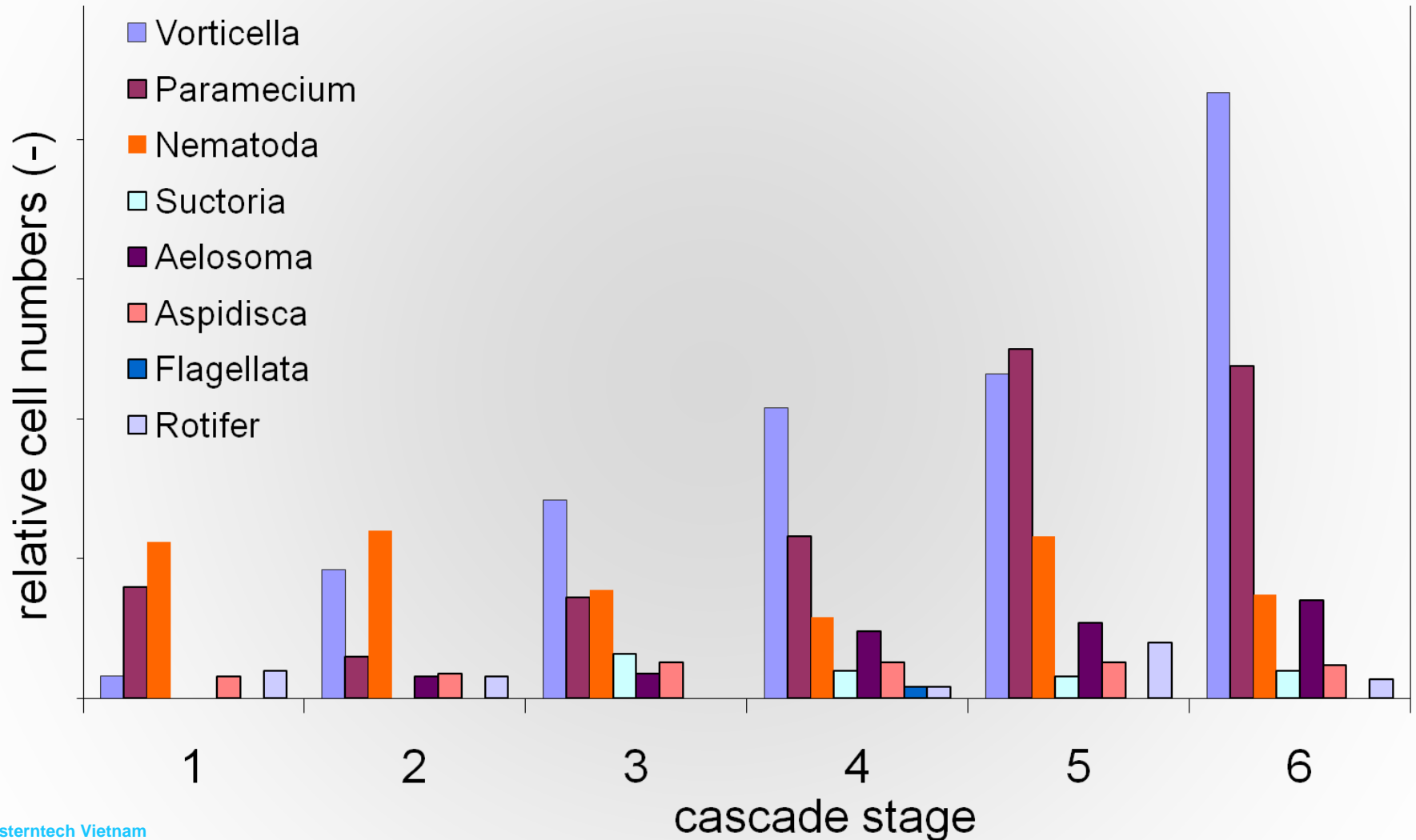
# Organica FCR Requires Significantly Less Energy Than Competitive Technologies



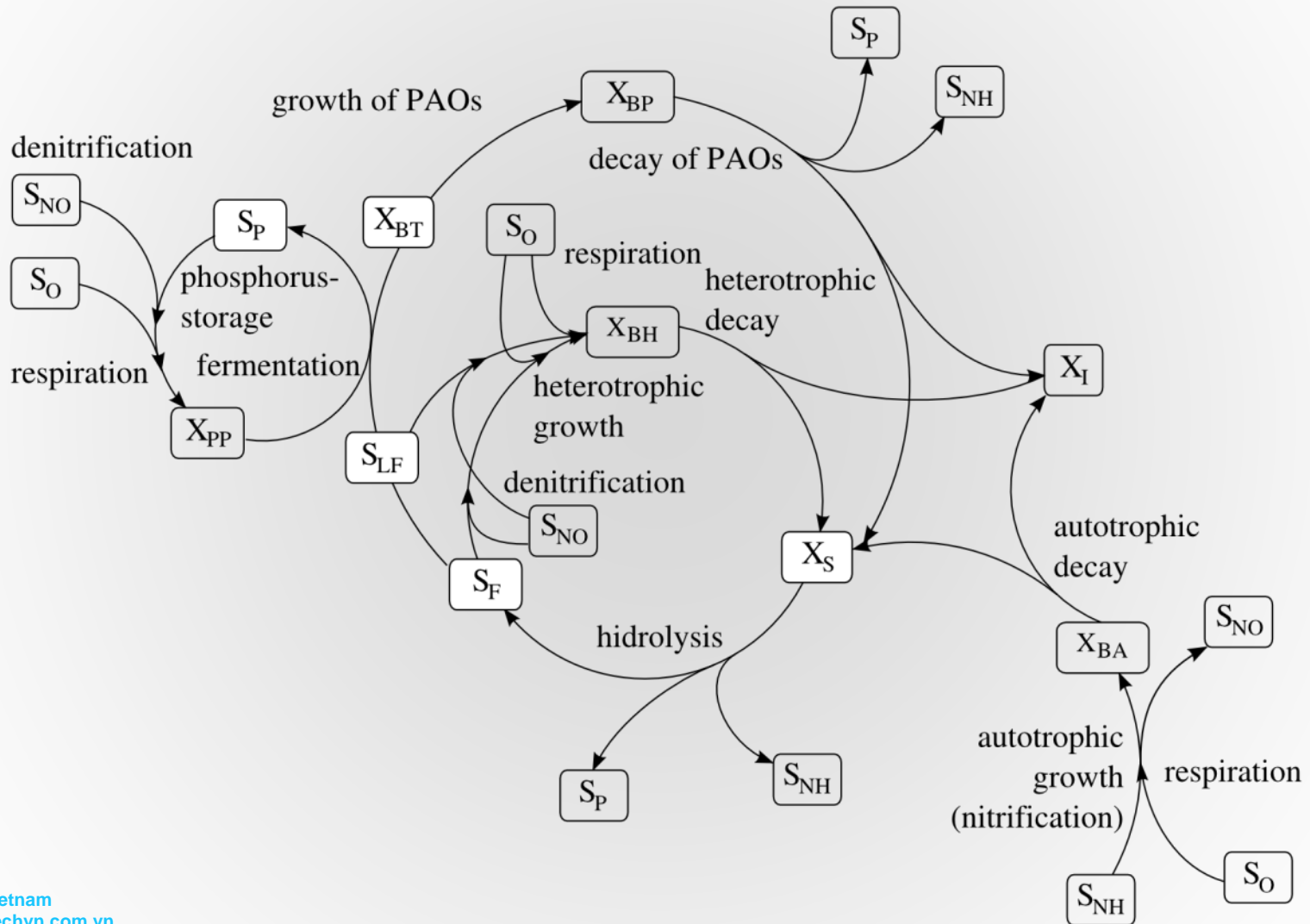


- BACTERIA
- PROTOZOA
- WORMS (Nematodes, Rotatoria)
- MOLLUSC (MUSSELS, SNAILS)
- ARTHROPOD (CRAYFISH)
- PLANTS
- FISH

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

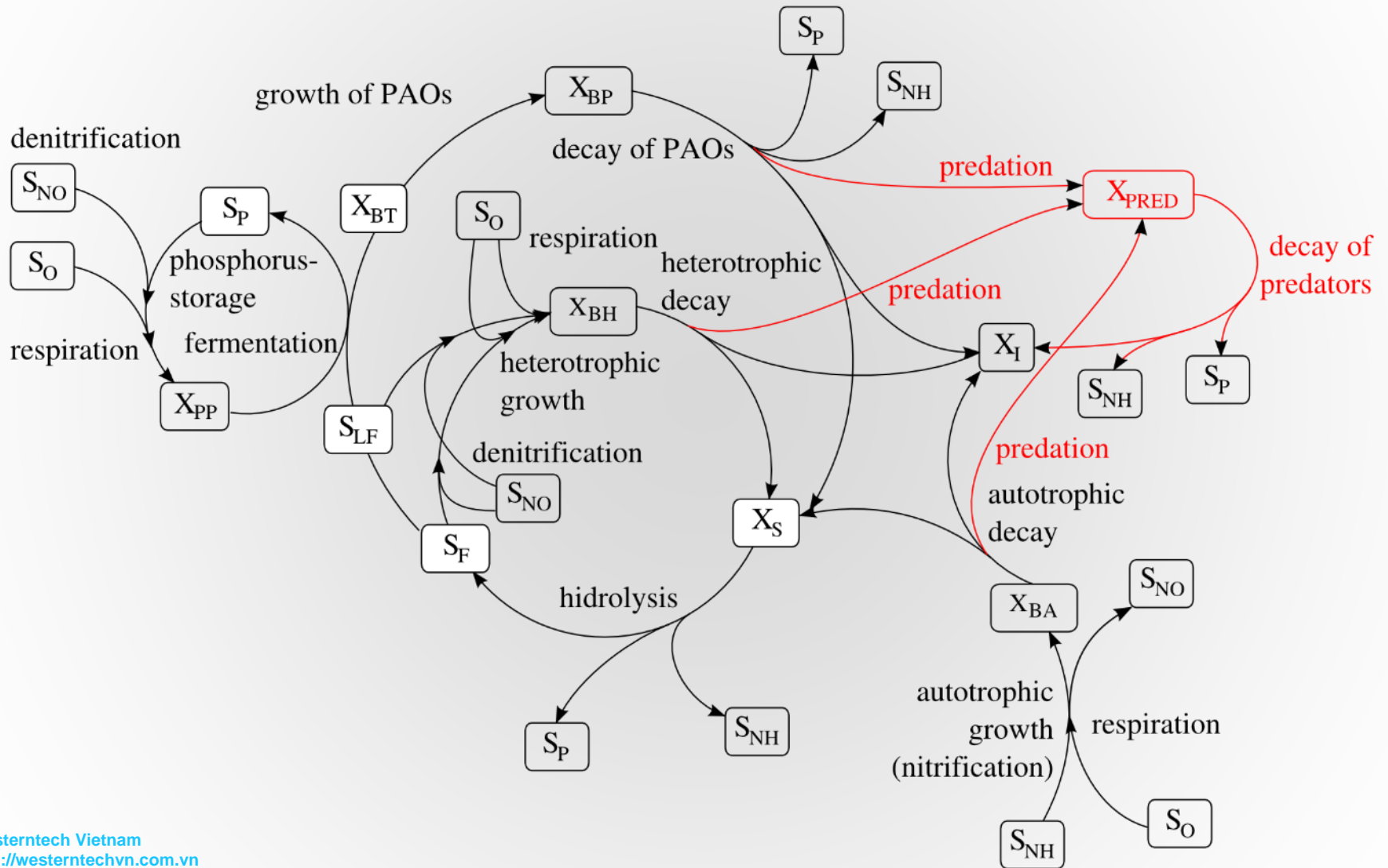


# Standard Industry Model – ASM2D

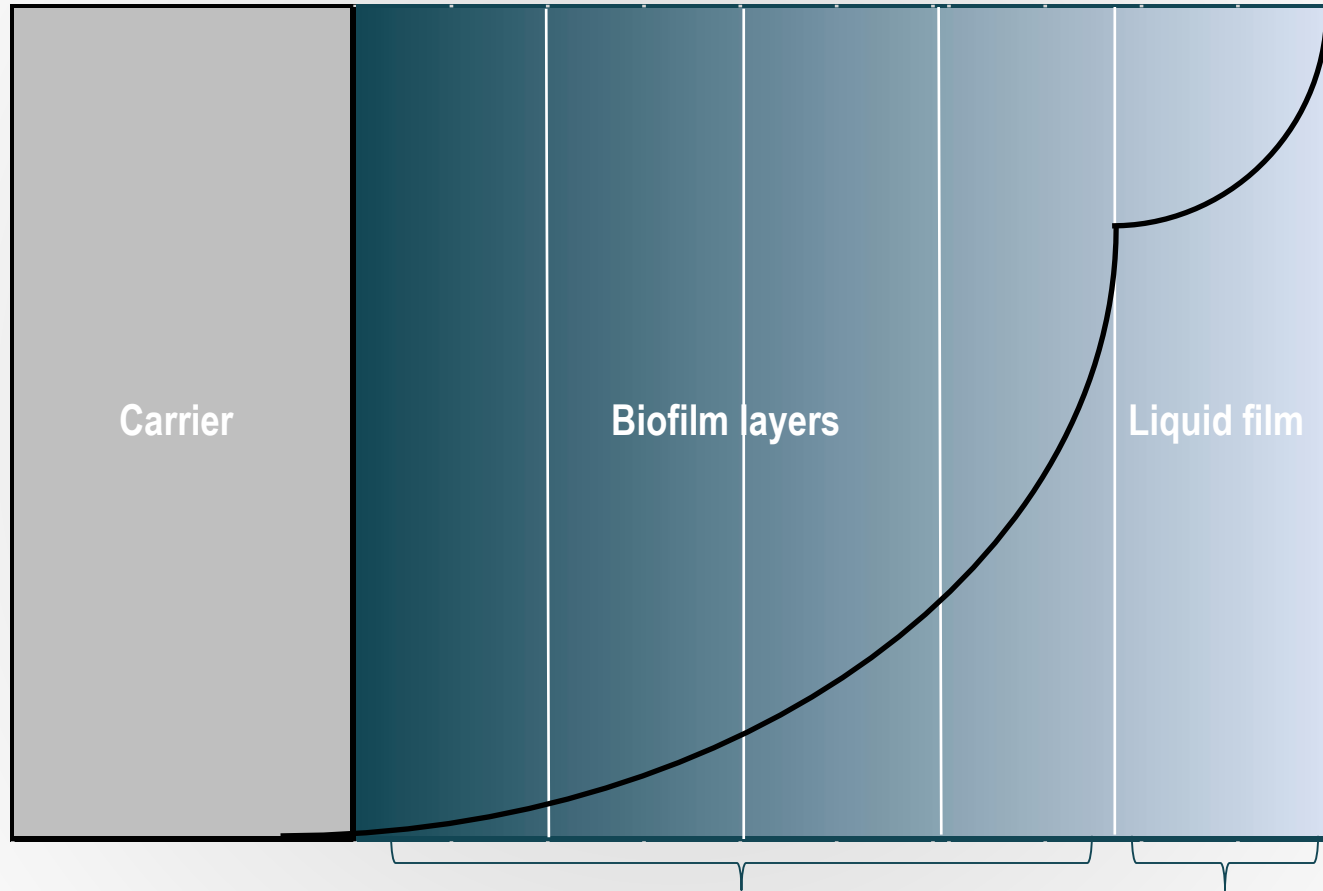




# Model Modification Including FCR Predation



# Organica Modeling Process Includes Mass Transfer Decay Through Each Biofilm Layer

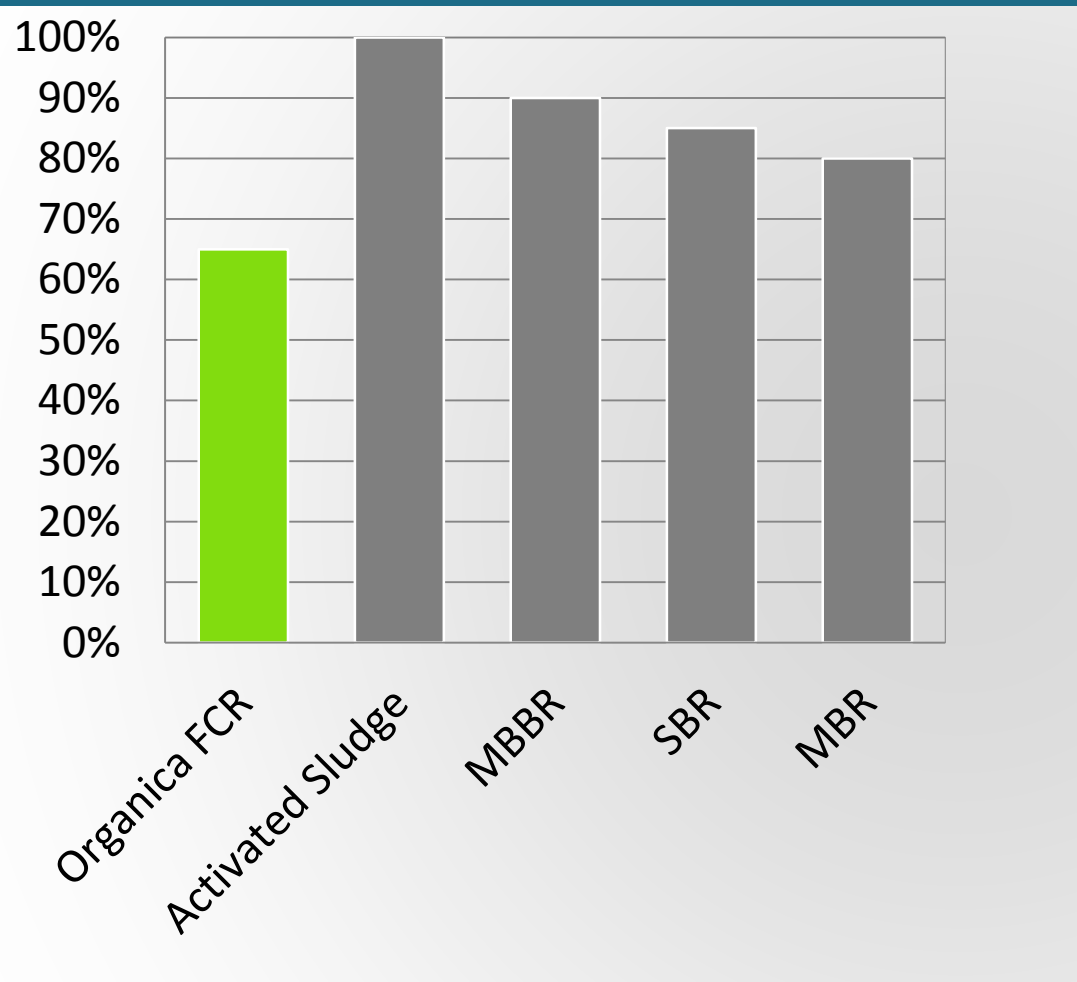


Oxygen - (substrate;  
biomass) profile

Inside the  
biofilm

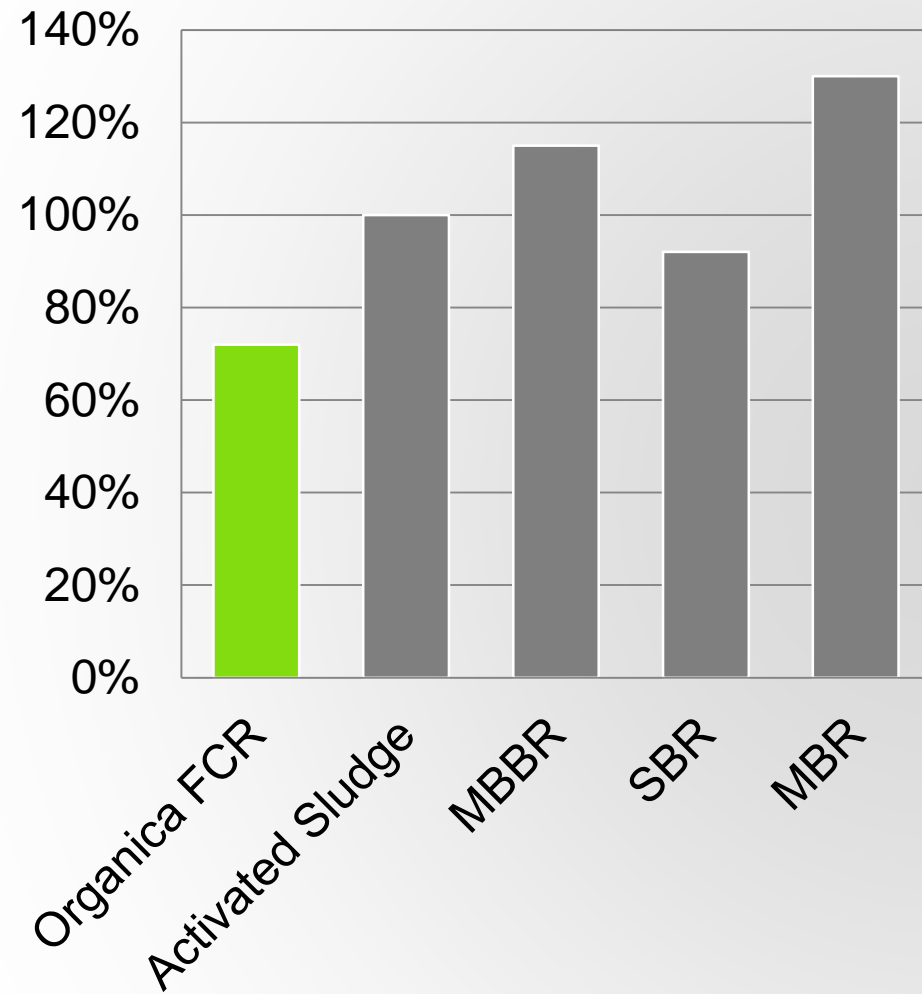
Between biofilm and bulk  
liquid phase

# 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.

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# Organica Disc Filter Offers Significant Footprint Reduction Over Secondary Clarifiers



Secondary Clarifier

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Disc Filter Unit

# Complete Organica FCR Design Provides Compact And Efficient Solution



Headworks

Control Room

Excess Sludge

Disc Filters

Blowers

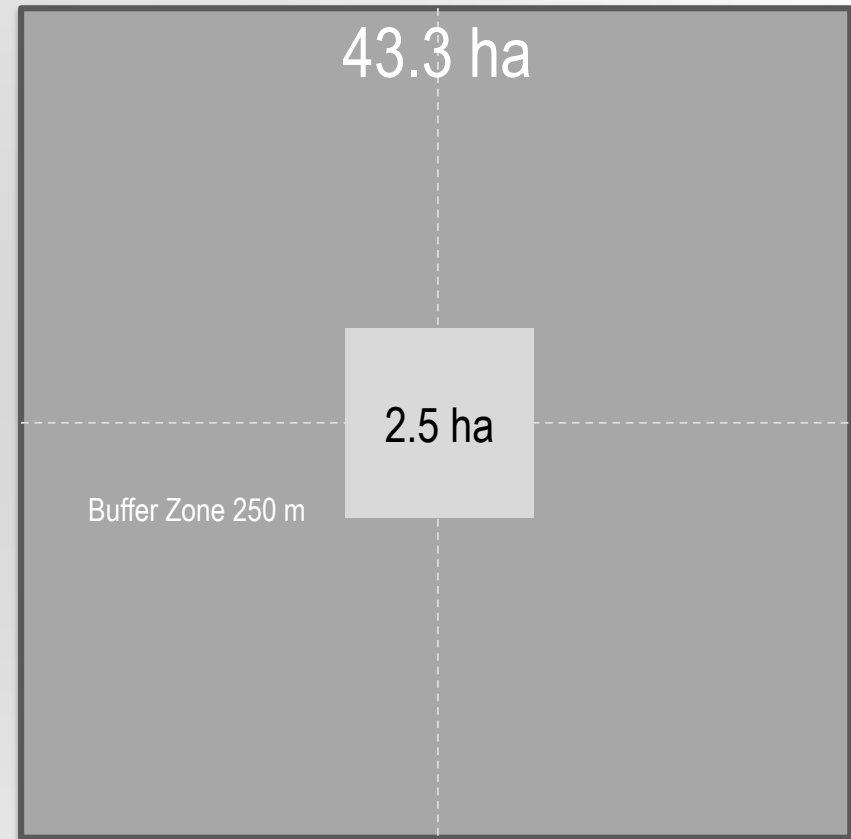
Biological Reactors w/  
Plant Roots and Biofiber  
Media

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# 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

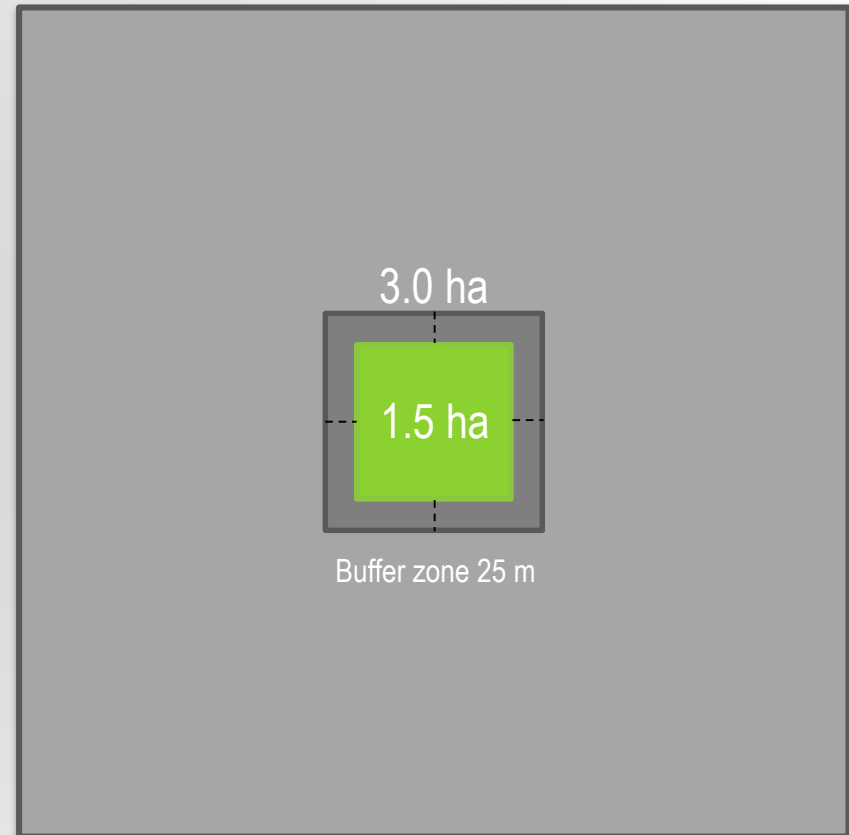


# Organica FCR Reduces Both Treatment System And Buffer Zone Space Requirements

## 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**



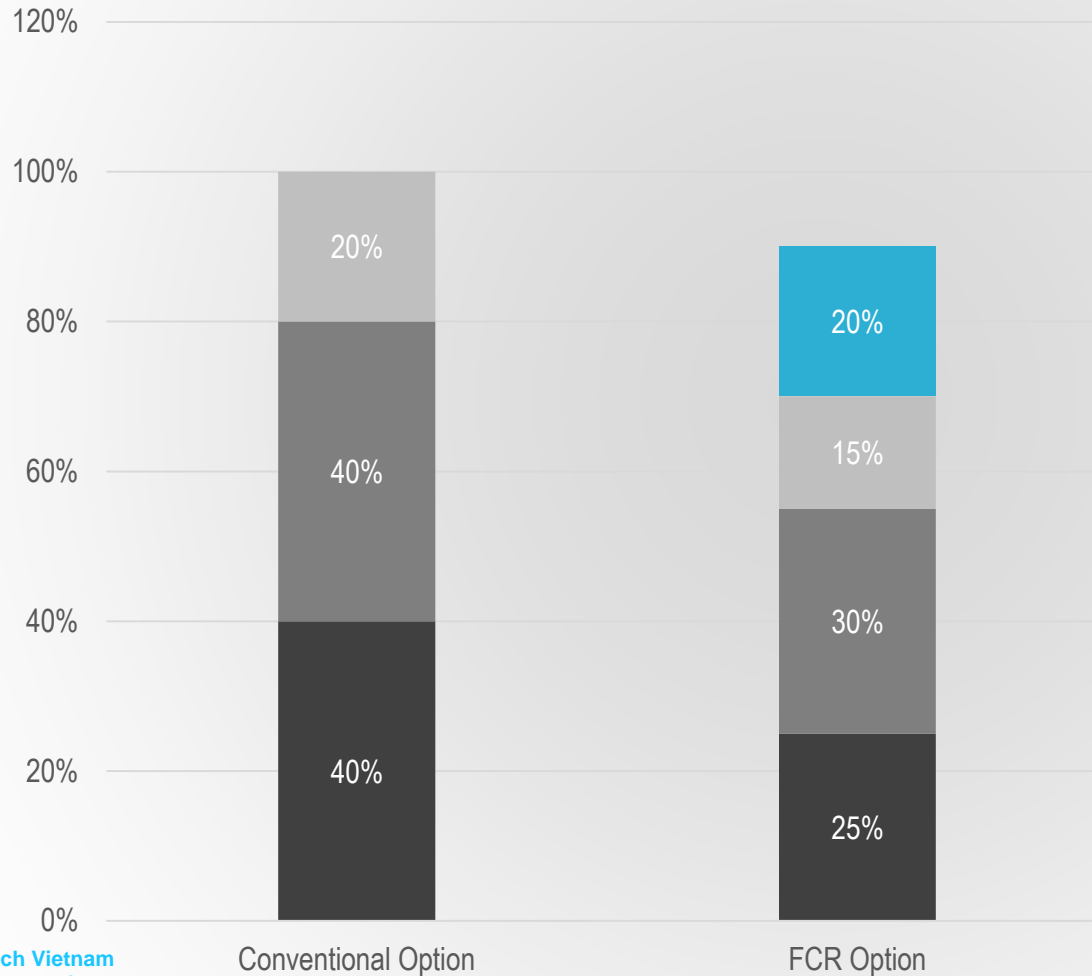


# Land Savings Provides Significant Value

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



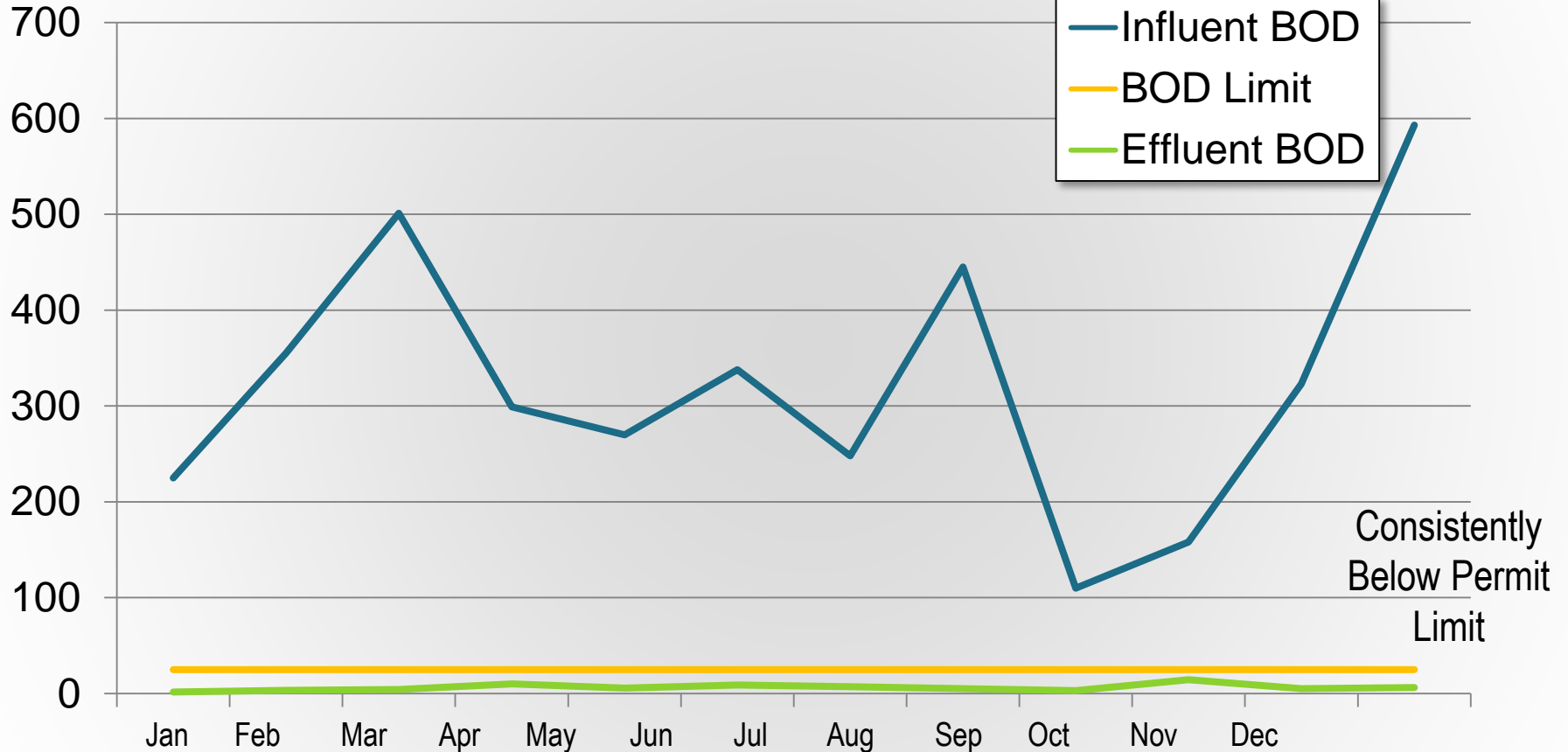
10% Savings  
on Total Capital  
Cost

- 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”



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# Facilities Provide Community Interaction And Benefits



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# Organica FCR Offers Significant Advantages

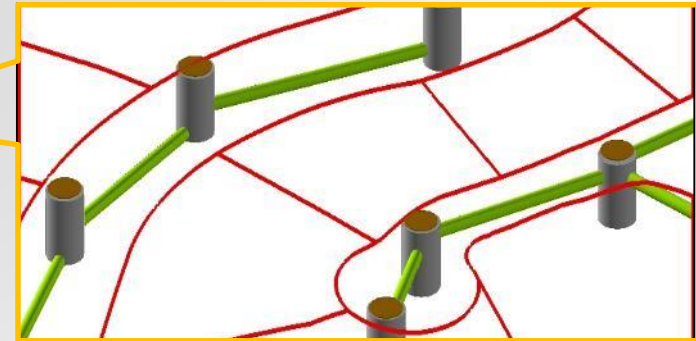
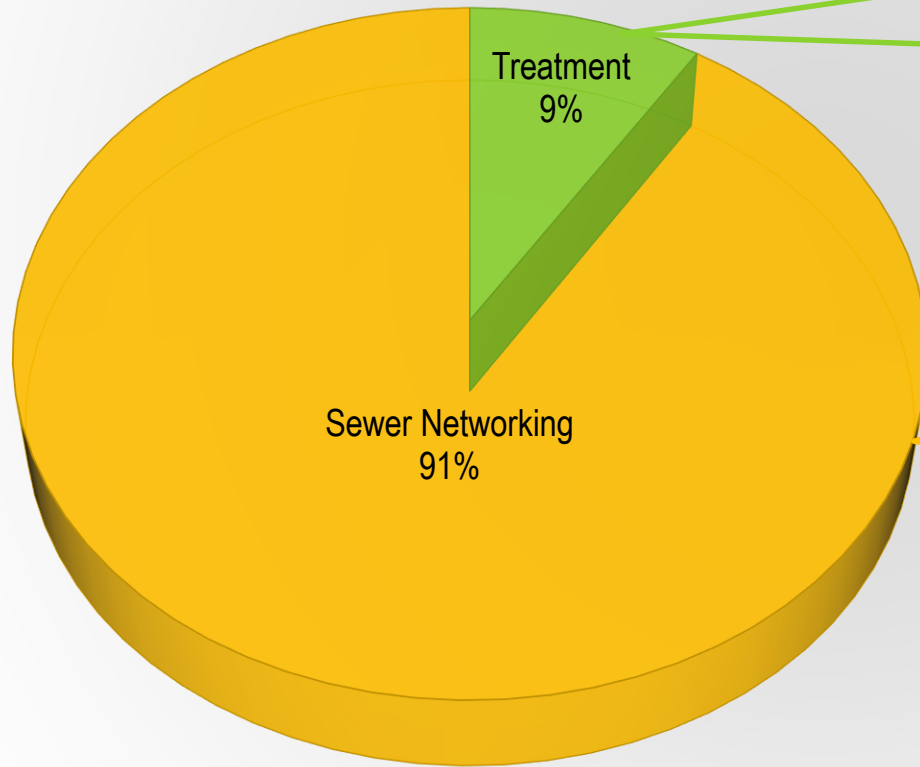


- Up to 60% Reduction In Physical Footprint
- 30% or Greater Reduction in Operating Expense (OPEX), driven by lower energy and sludge production
- Enhanced Biodiversity - Resilient and Stable System
- Unique Look & Feel enables WWTP to be strategically located virtually anywhere



# 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

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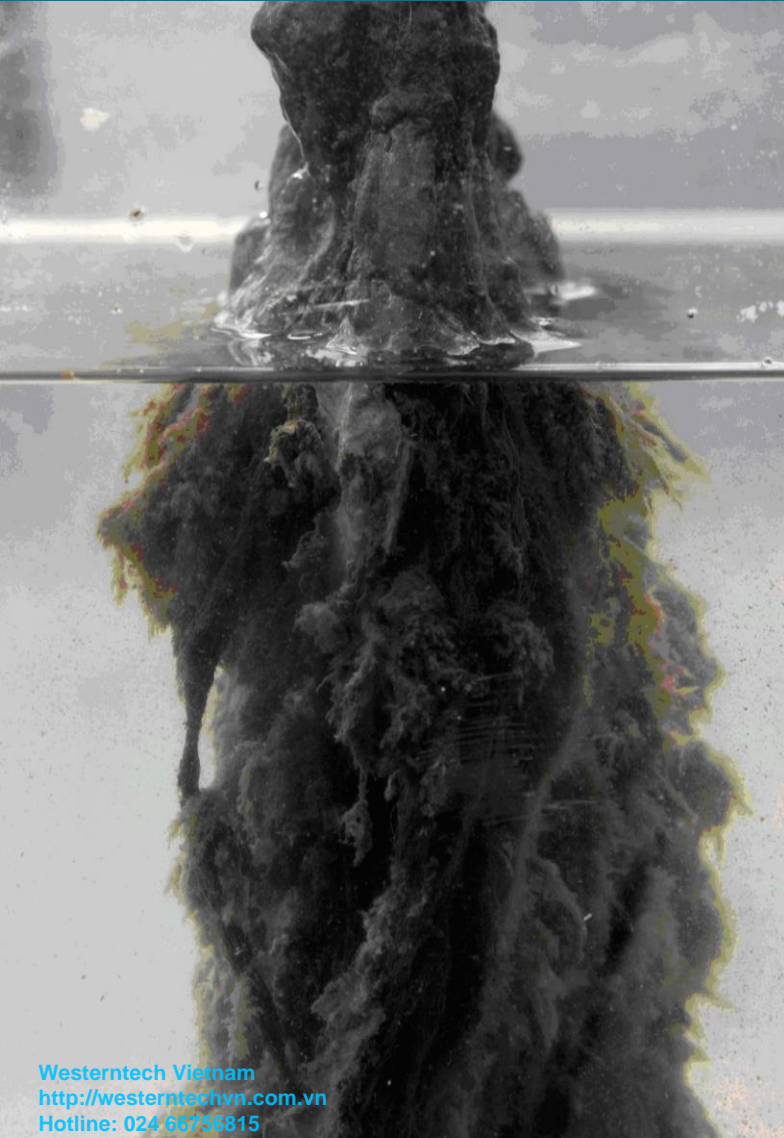


# Who Is Organica?



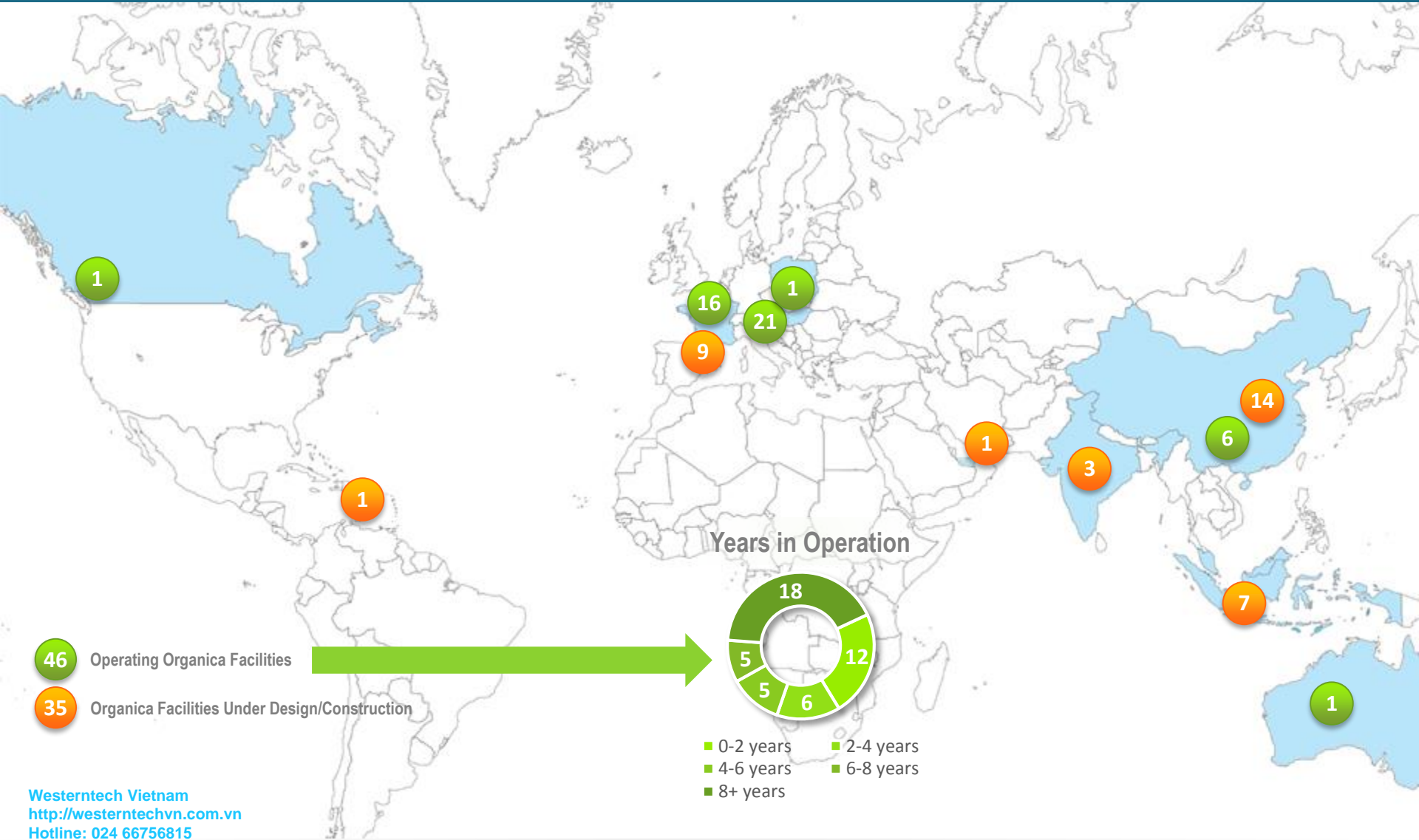
- Provider of cost and space efficient solutions for biological wastewater treatment
- 15 years of history and 50+ references operating / under construction up to 80,000 m<sup>3</sup>/d
- Organica provides facility design and specialty equipment supply, enabling local EPC contractors and consultants deliver projects
- The future standard “operating system” for municipal wastewater treatment plants (WWTPs) in the 21<sup>st</sup> 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



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# 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)**

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# Global Presence Supports Wide Range Of Geographical Markets



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



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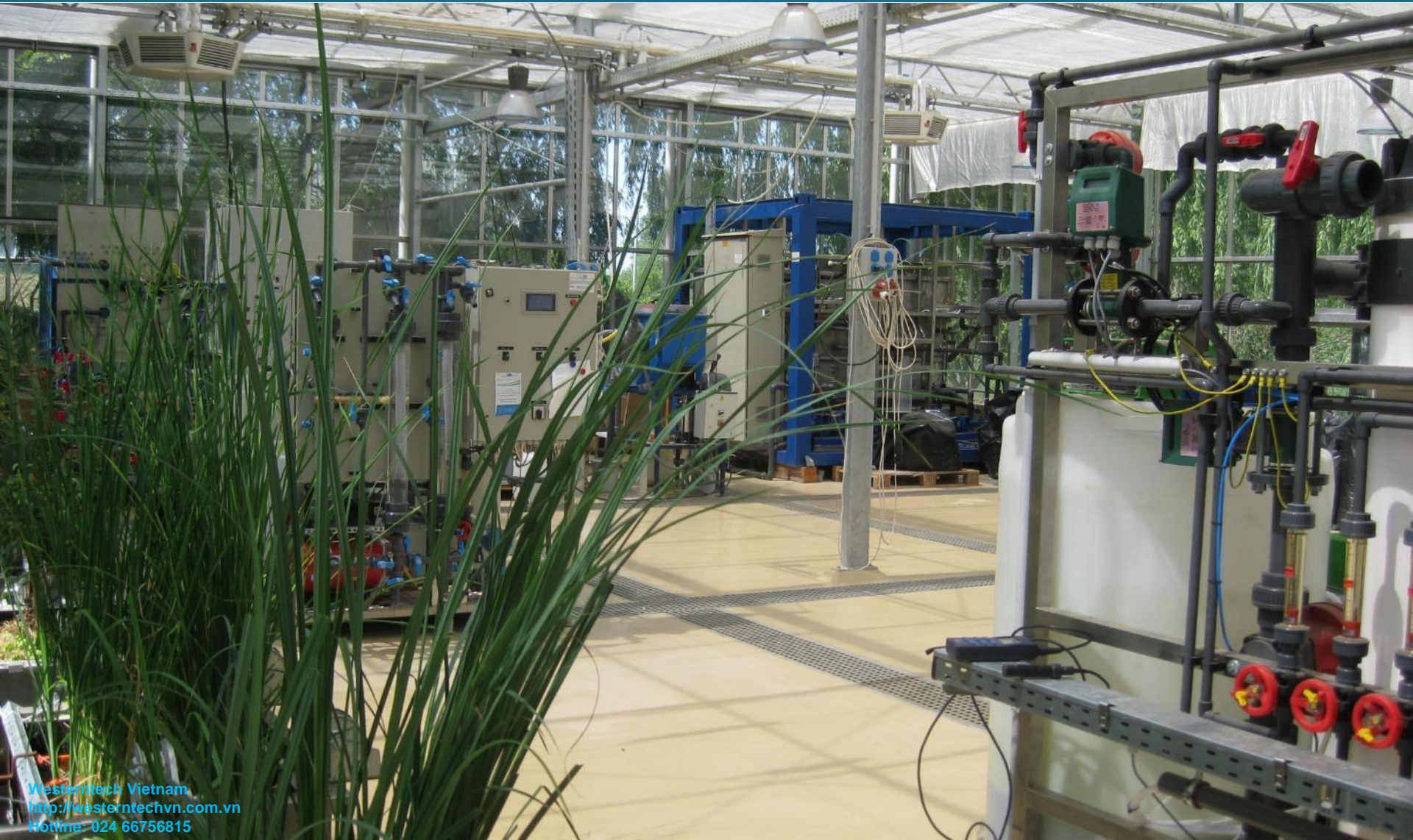
# R&D Center With Cascade Reactors In Operation



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# R&D Center With Multiple Treatment Processes In Operation



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



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# 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

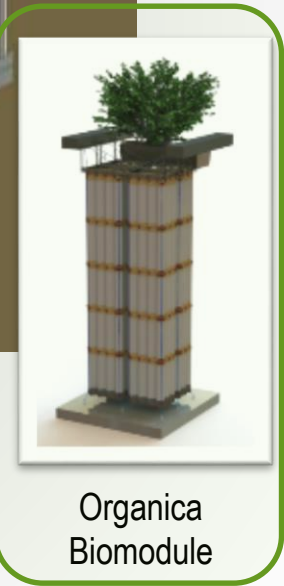
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# Complete Organica FCR Design Provides Compact and Efficient Solution



Organica Discfilter (or clarifier)

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Organica Biomodule

# What Is An Organica Biomodule?



## Biomodule:

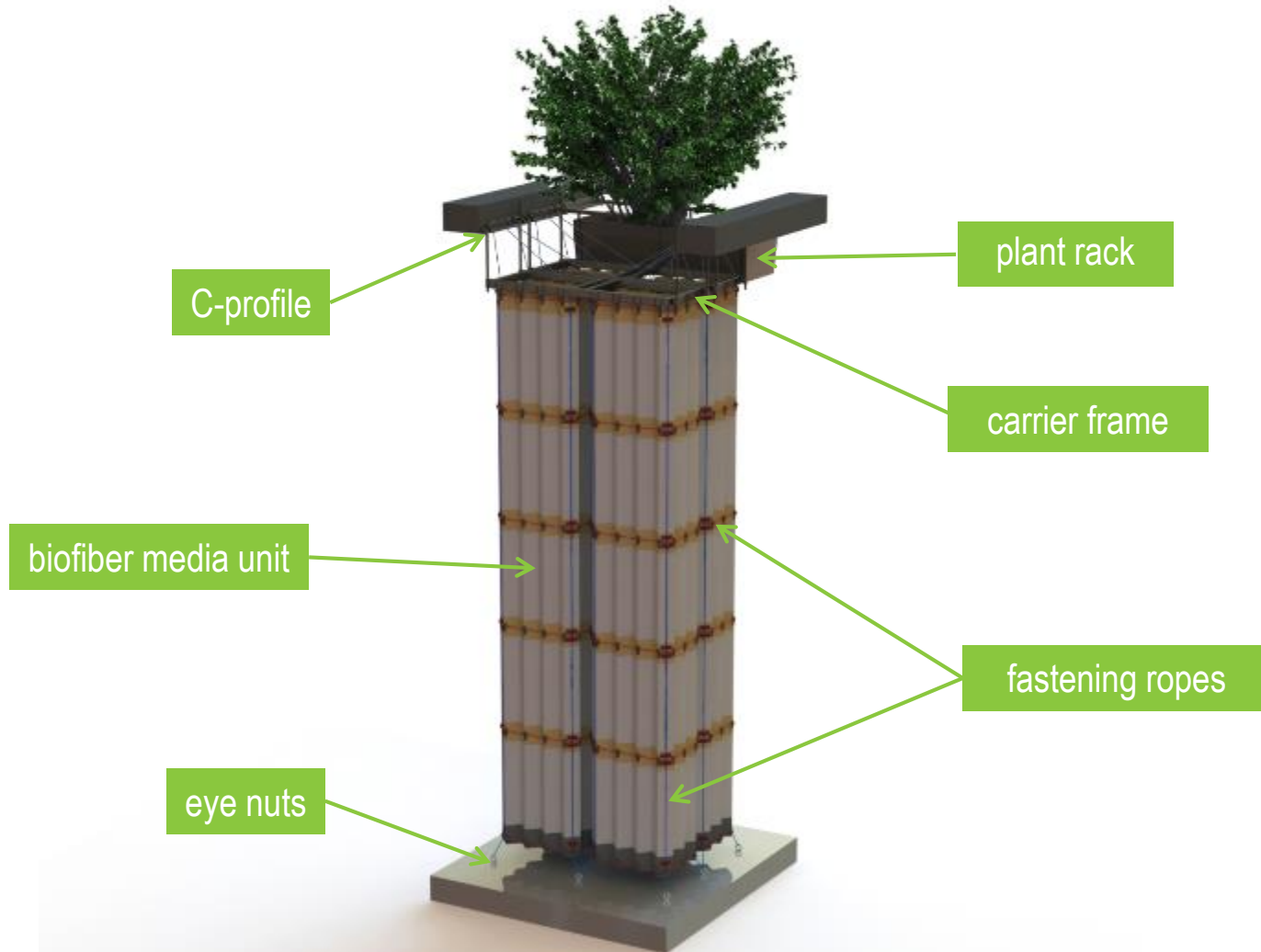
ready-to-install structure  
with plant racks and patented  
biofiber media units

## Purpose:

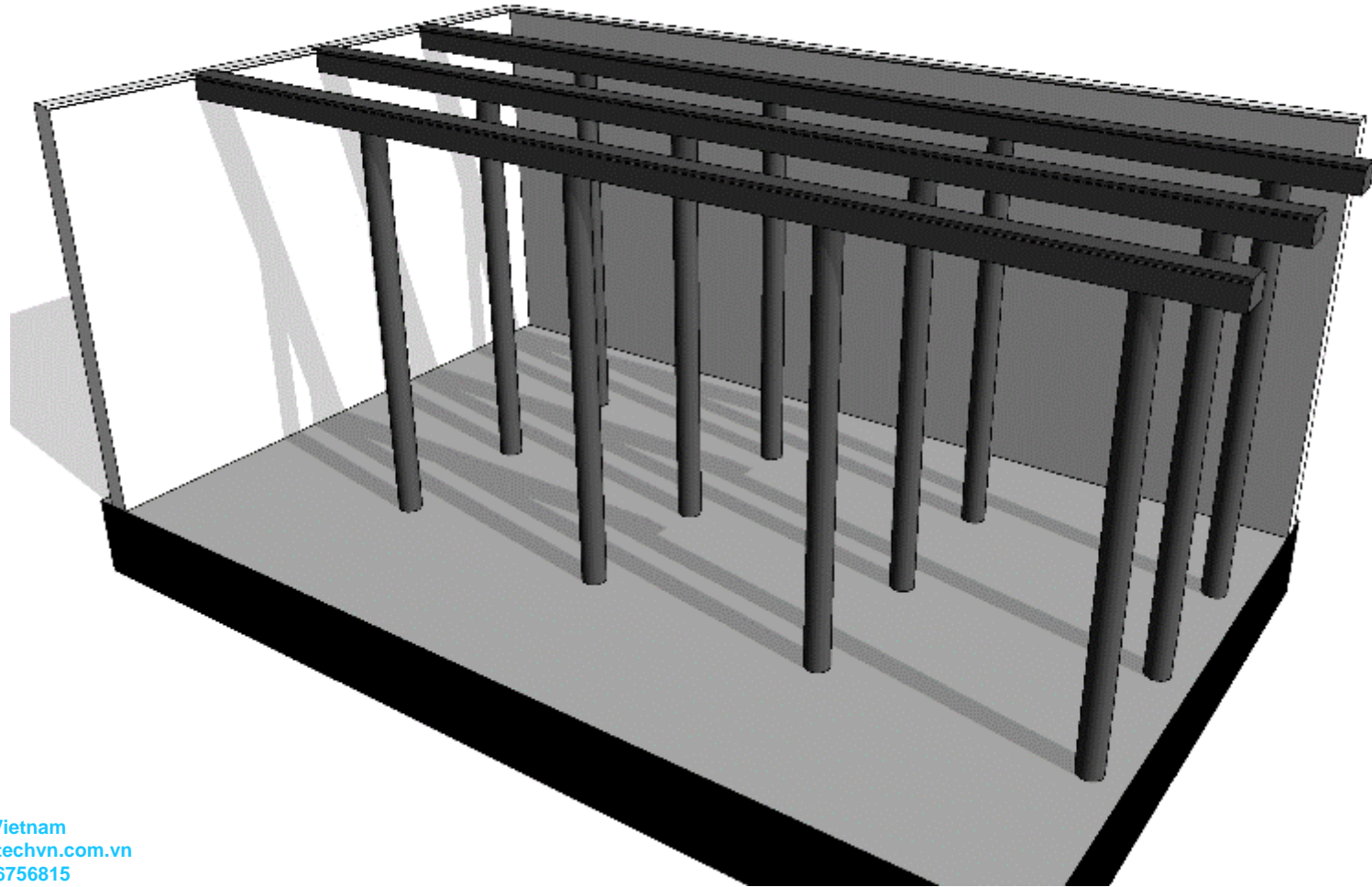
provides surface for biofilm  
growth



# Main Components of the Biomodule

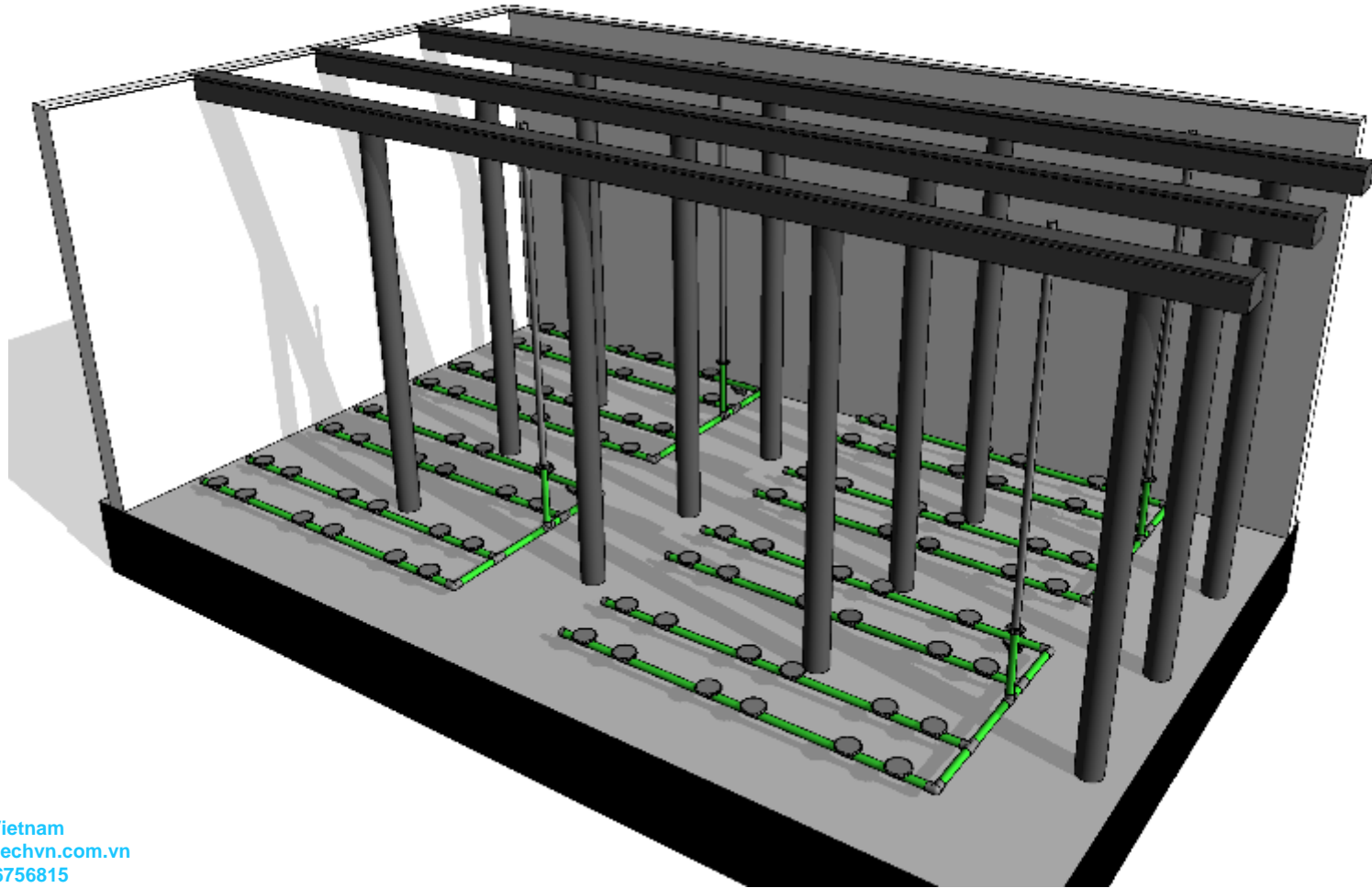


# Installation: Dividing Walls Create Cascade Reactor Design

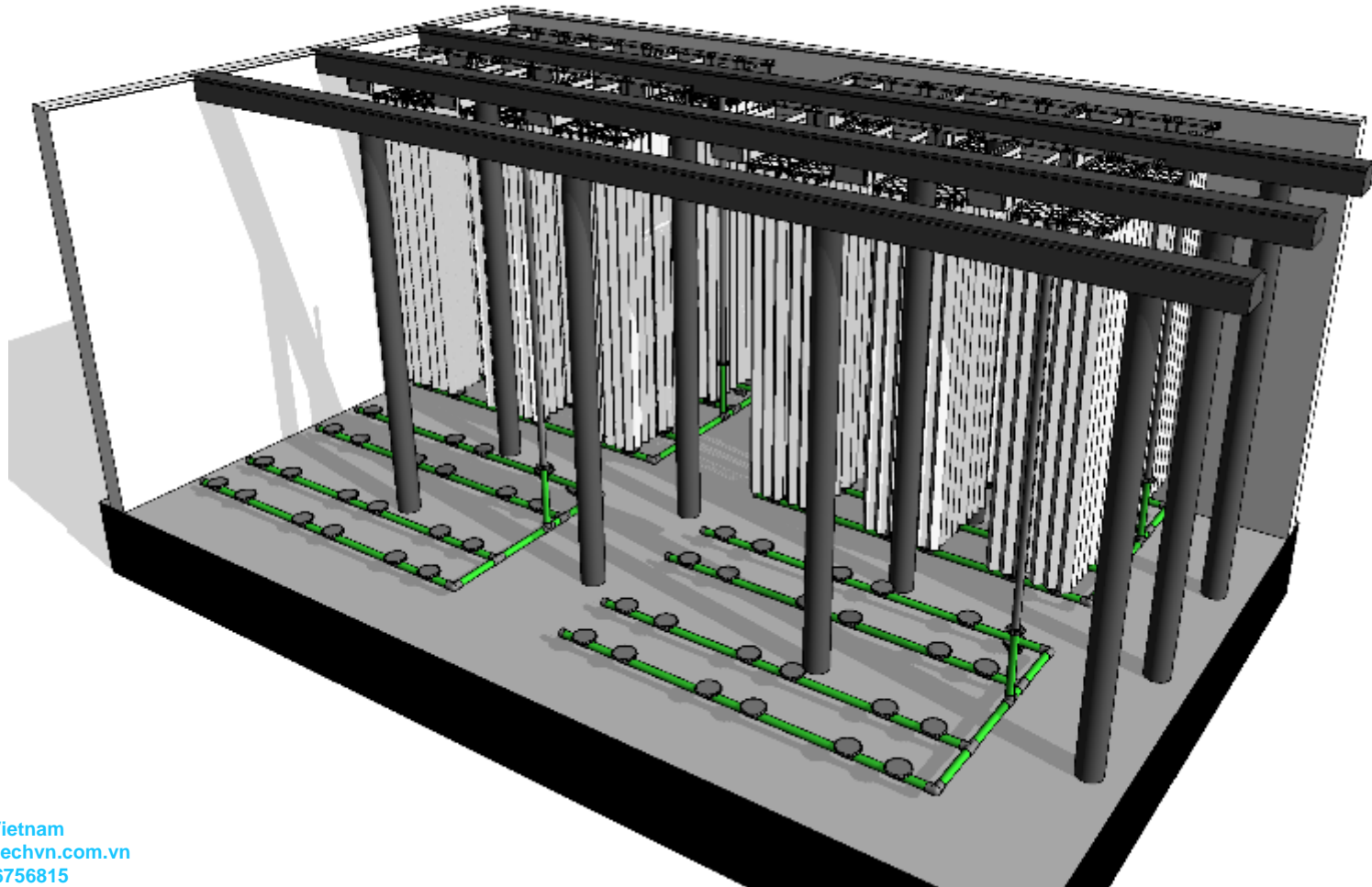




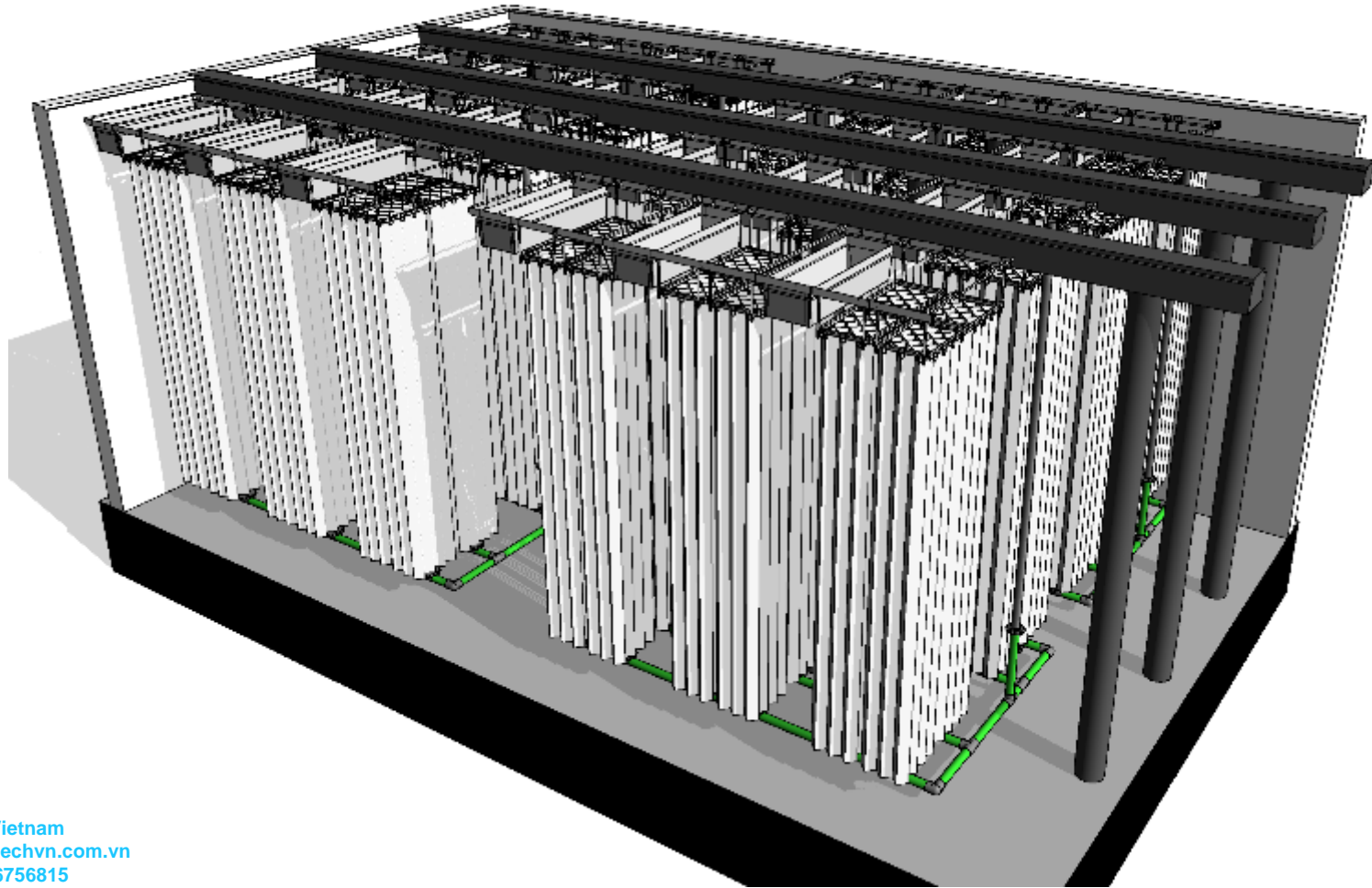
# Installation Step 1: Placement Of Aeration Panels Under Carrier Unit



# Installation Step 2: Attach Carrier Units To Reactor Walls



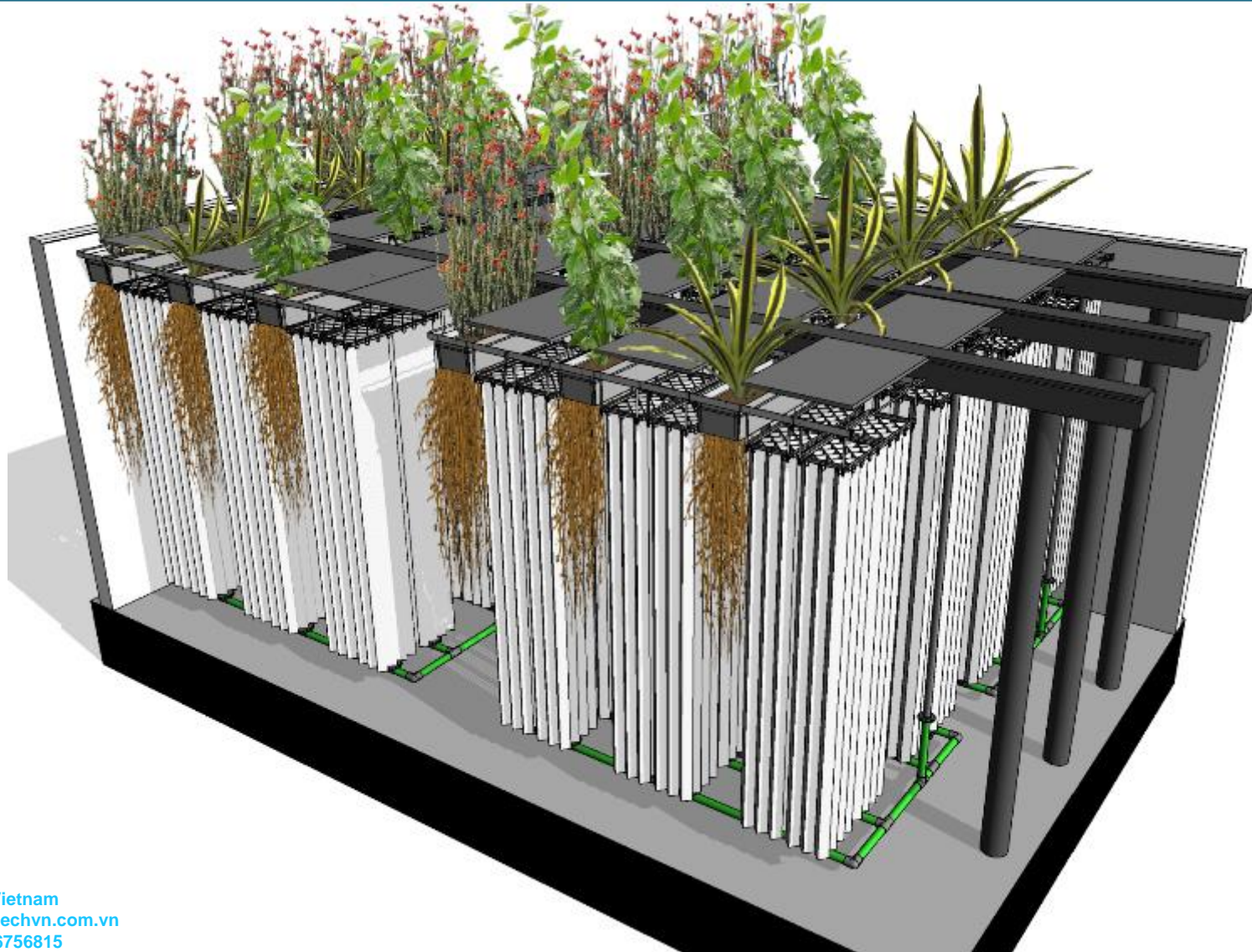
# Installation Step 3: Attach Plant Racks To The Cross Beams/Walls



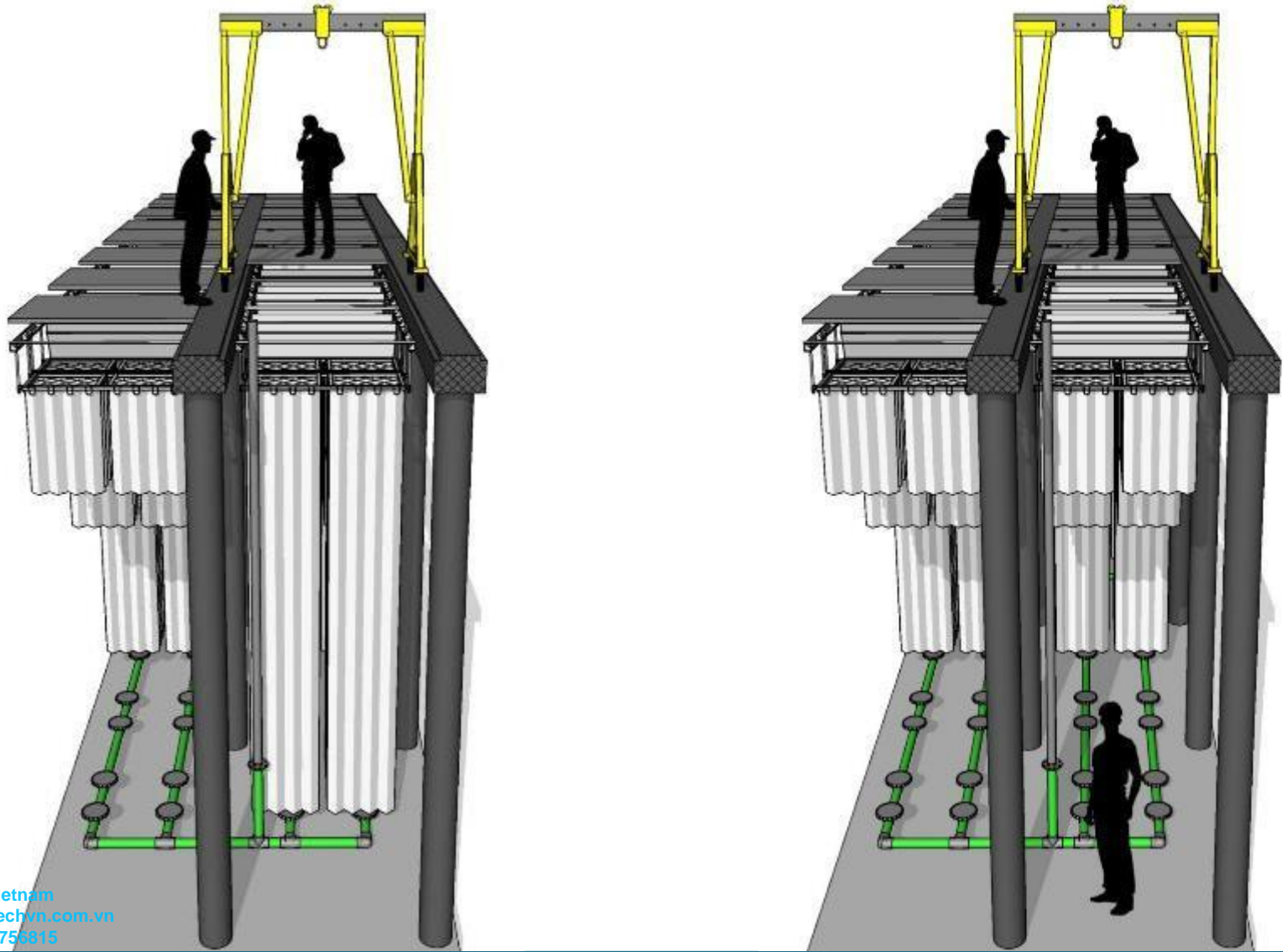
# Installation Step 4: Planting Of Local Species Into Plant Racks



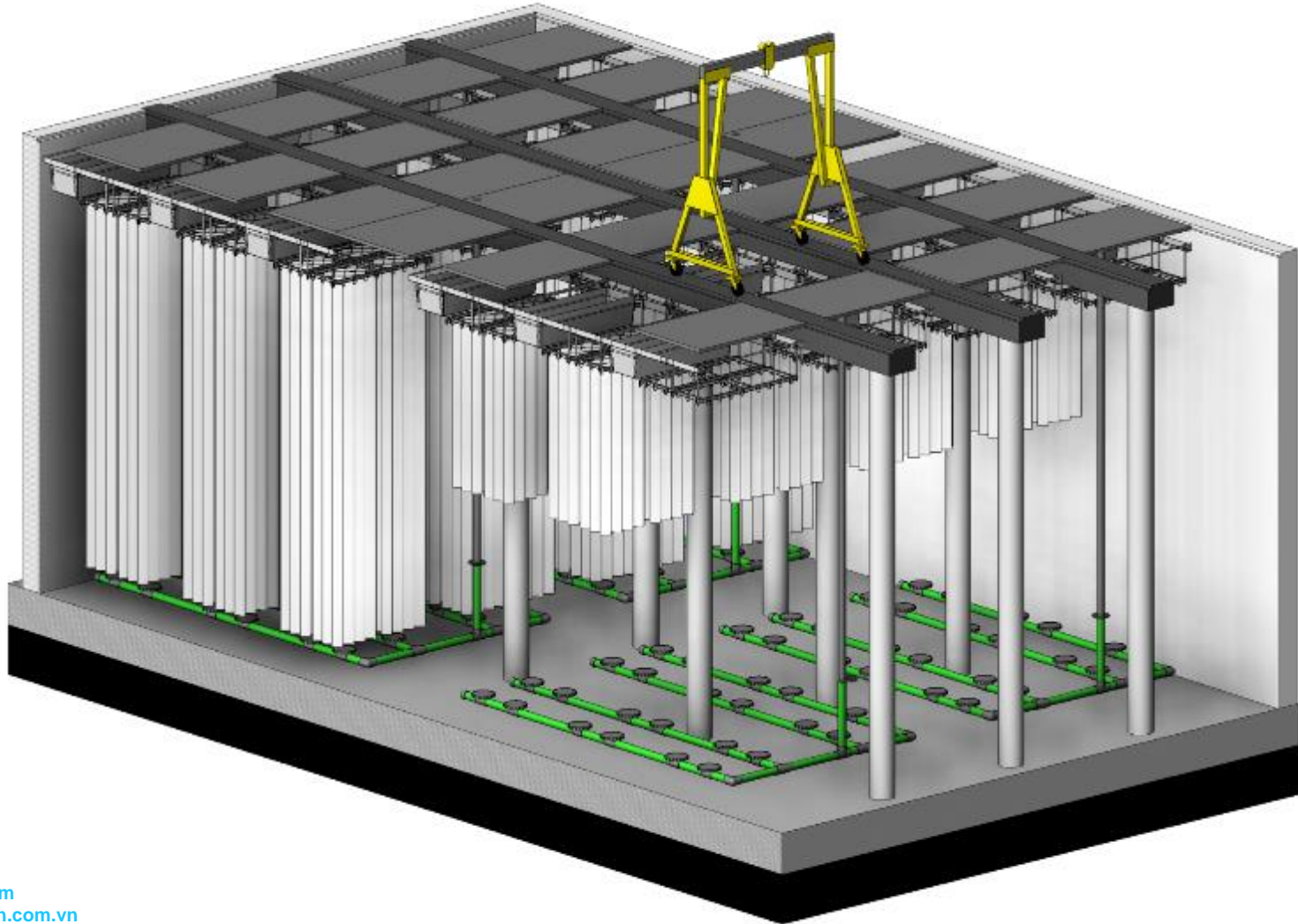
# Installation Step 5: Cover Carrier Units While Allowing Easy Access



# 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

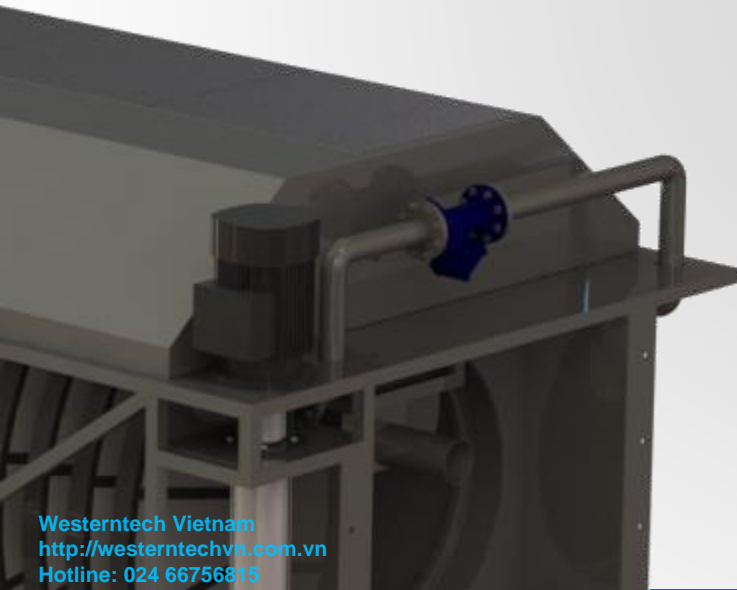
Long lifetime

## Disc Filter:

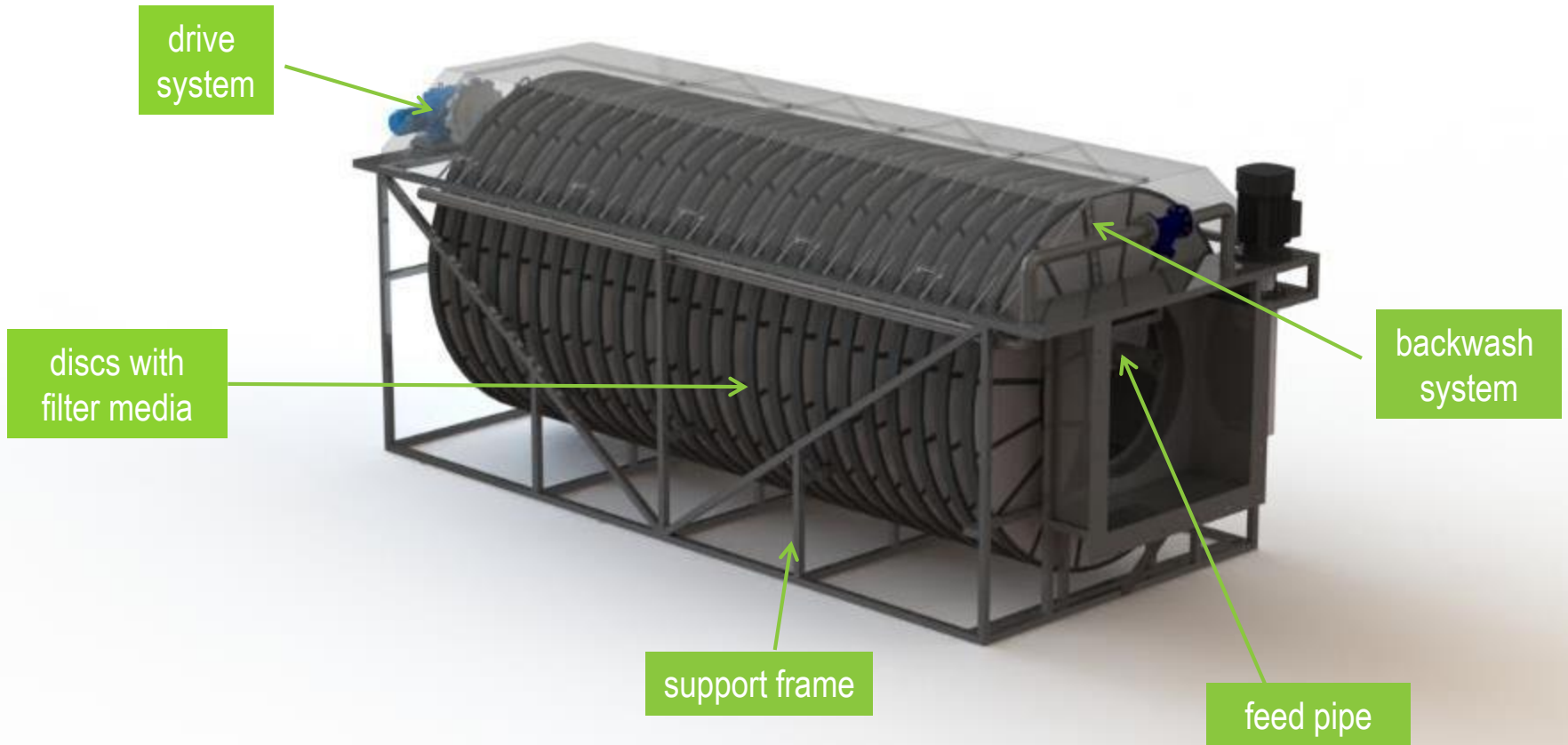
family of mechanical filtration devices for final solids separation

## Benefits:

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



# Main Components Of The Disc Filter



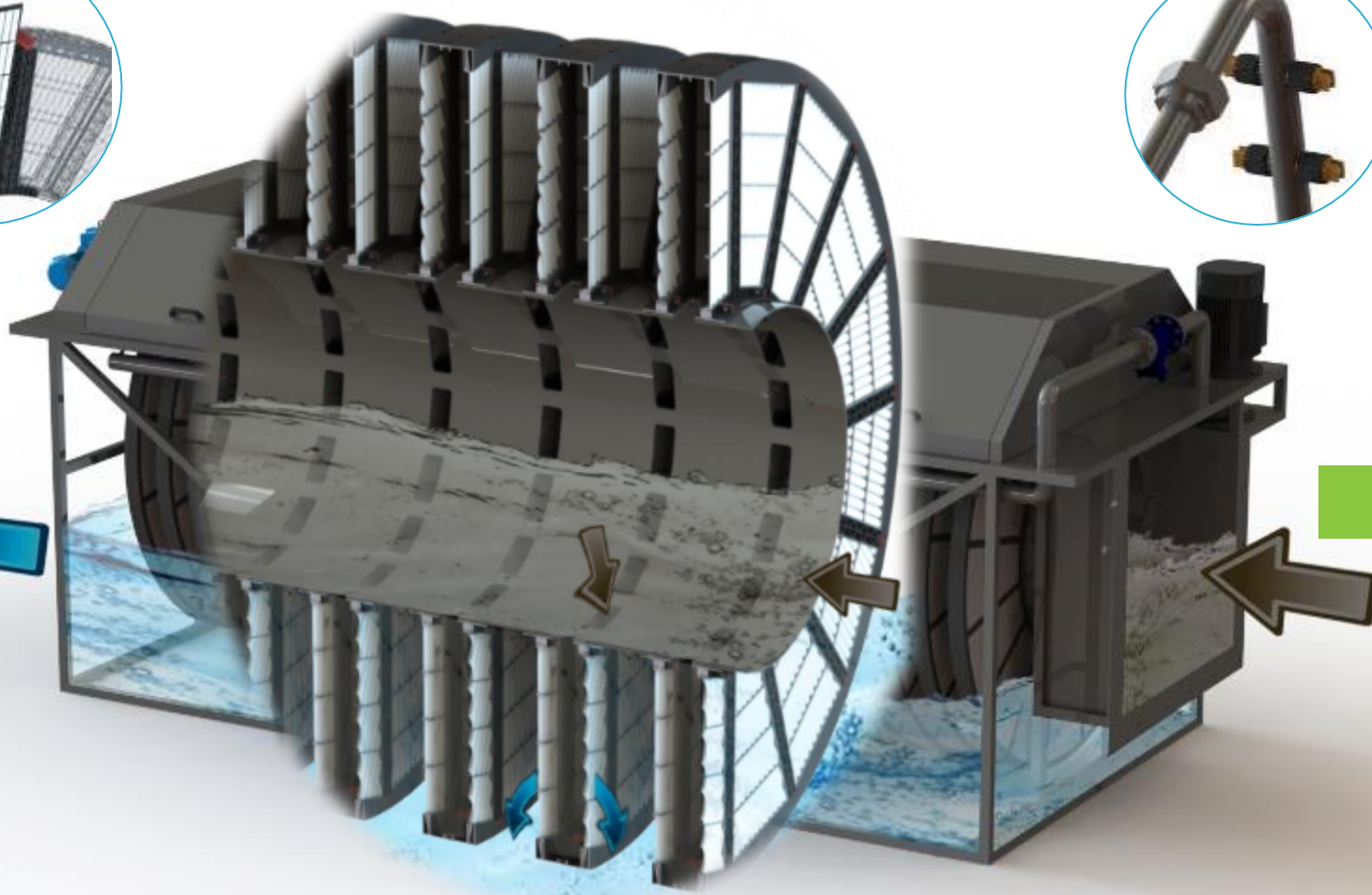
# Disc Filter Designed For Efficient Flow Patterns



Filtrate



Influent



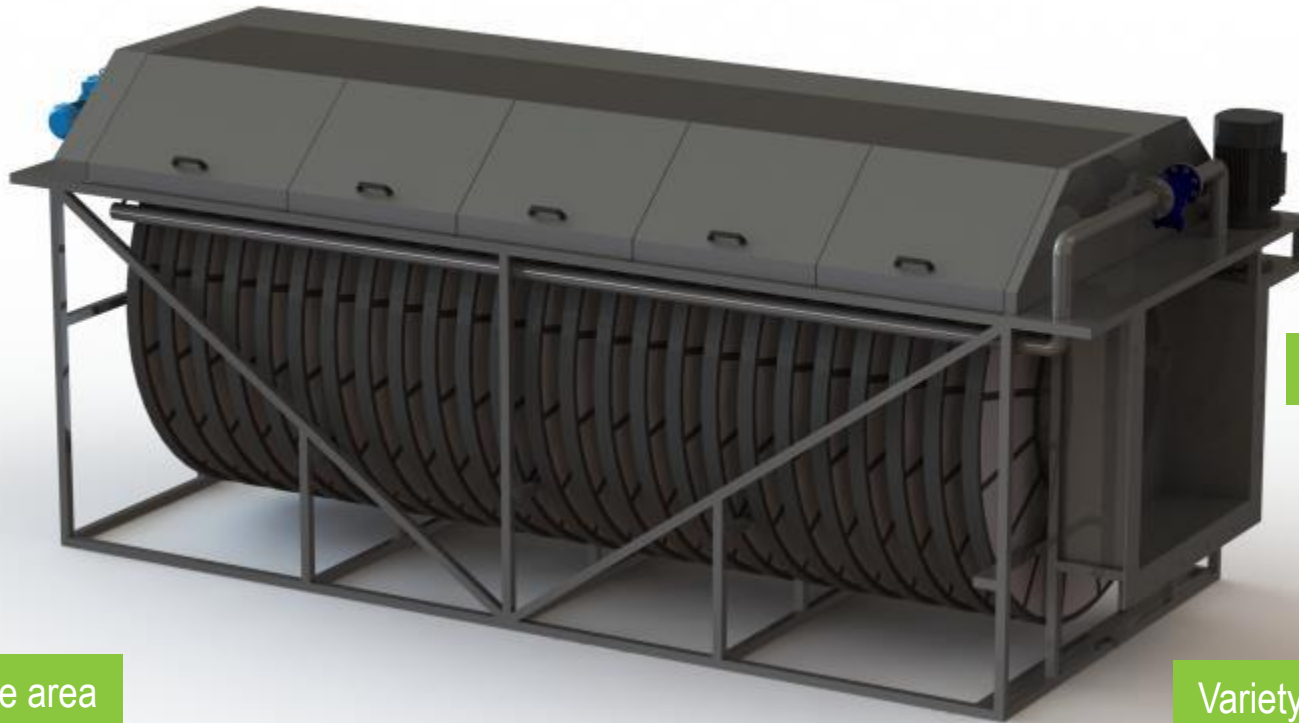
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# Disc Filter Offers Beneficial Design Features

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  $\mu\text{m}$ )

# What Is A High-Rate Clarifier?



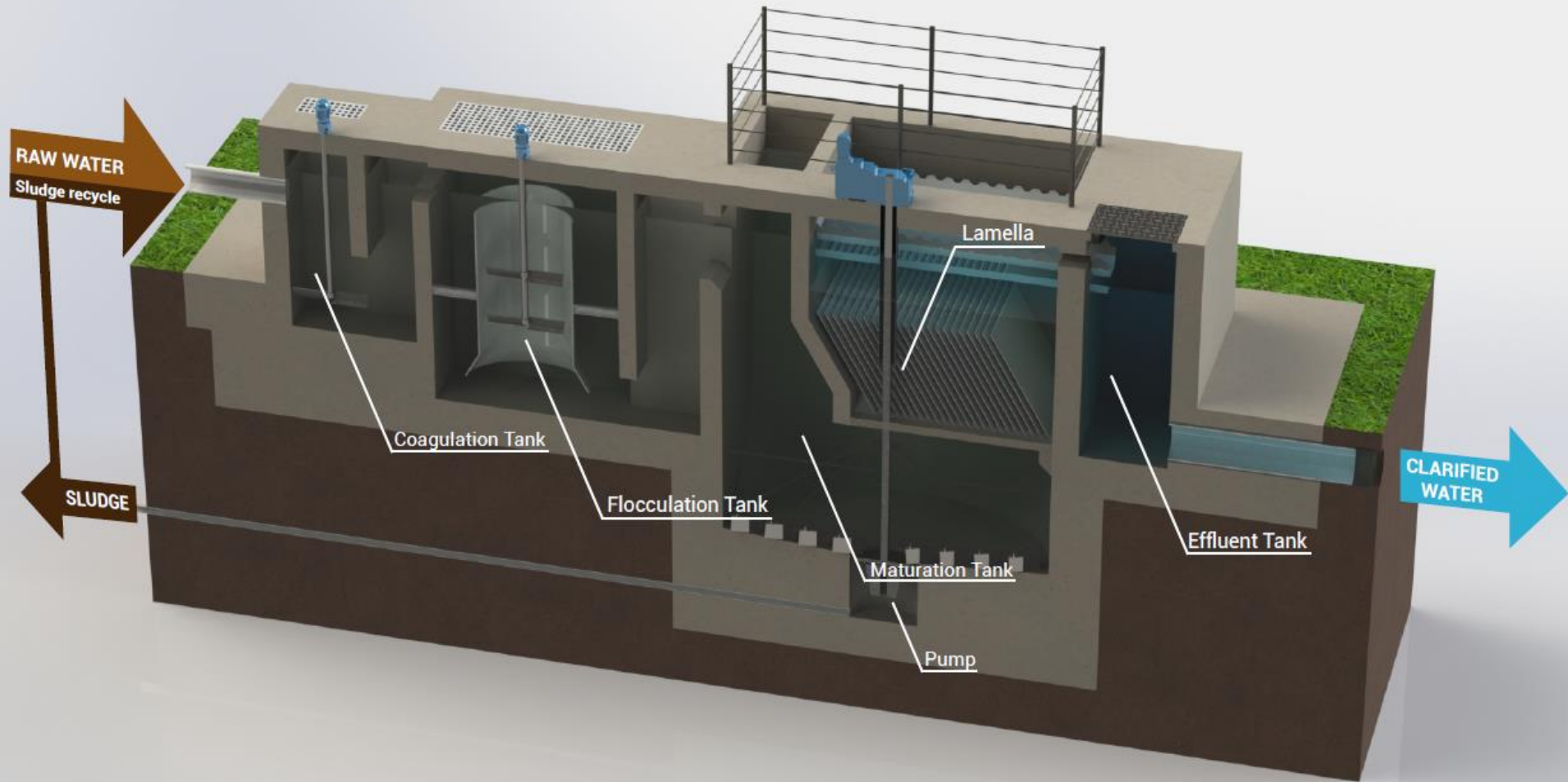
## High-Rate Clarifier:

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

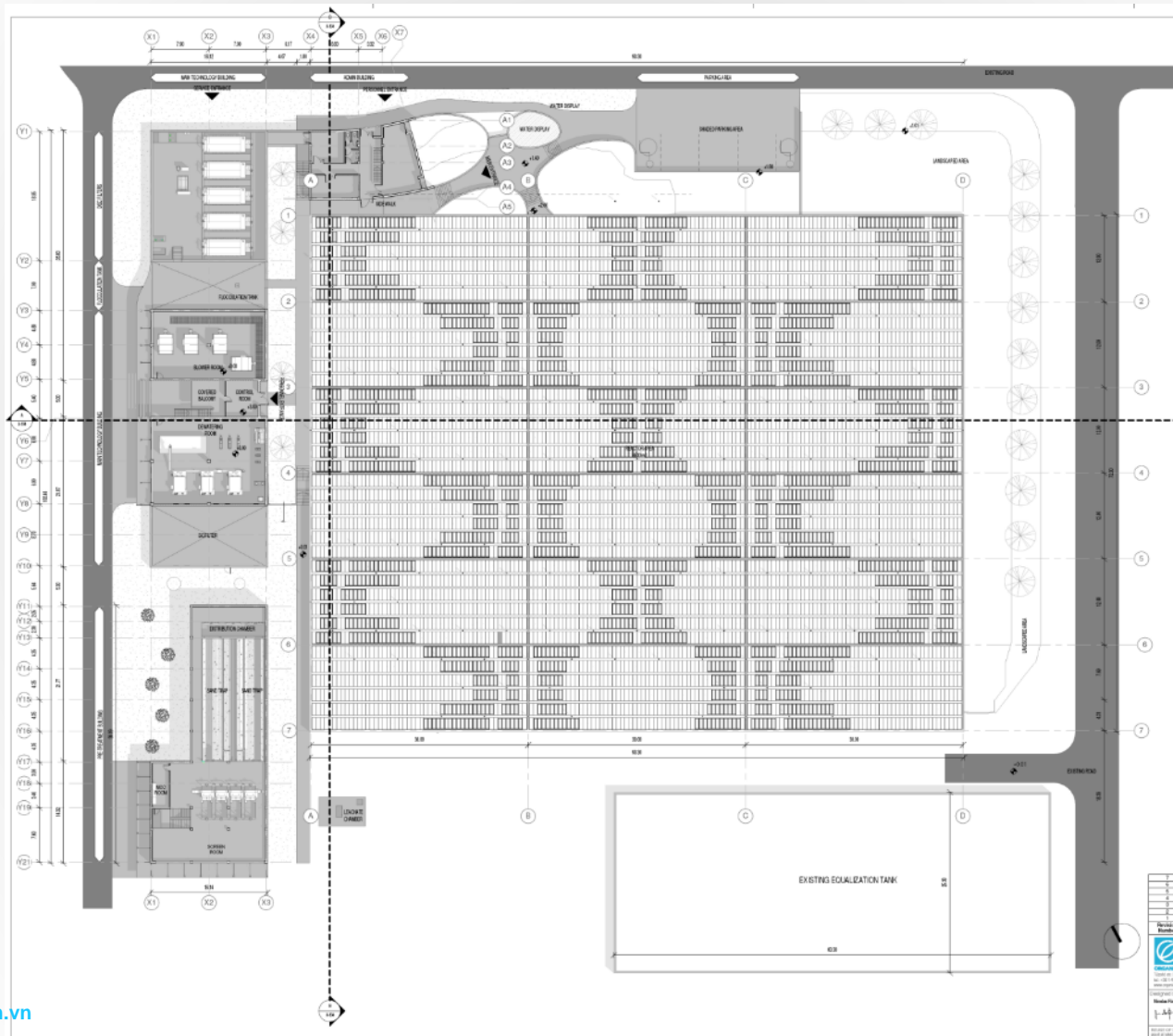
## Benefits:

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

# Basic operation of the High-Rate Clarifier

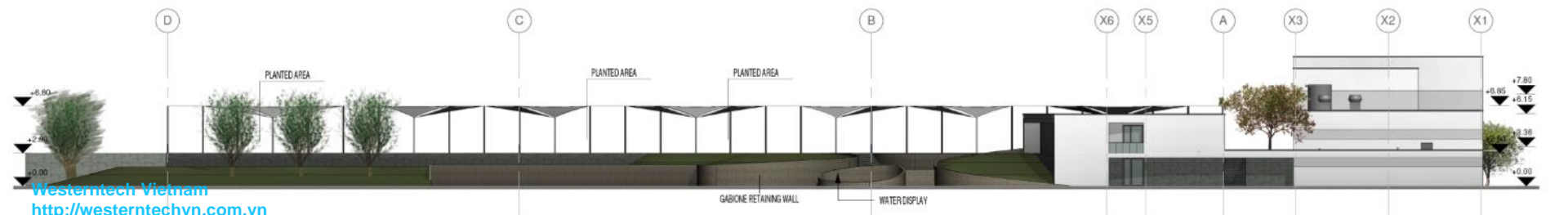
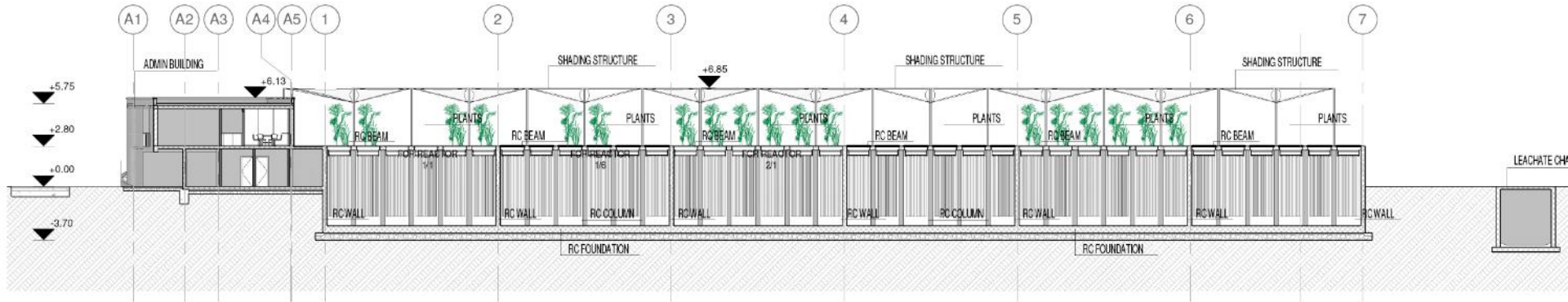


# Architectural Design – Site Plan 45 MLD in 1.2 ha





# Architectural Design – Section Views



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# Enclosure Options Depend Upon Local Conditions



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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



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# Urban Integration Based on Local Conditions



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# Urban Integration Based on Local Conditions



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Hotline: 024 66756815

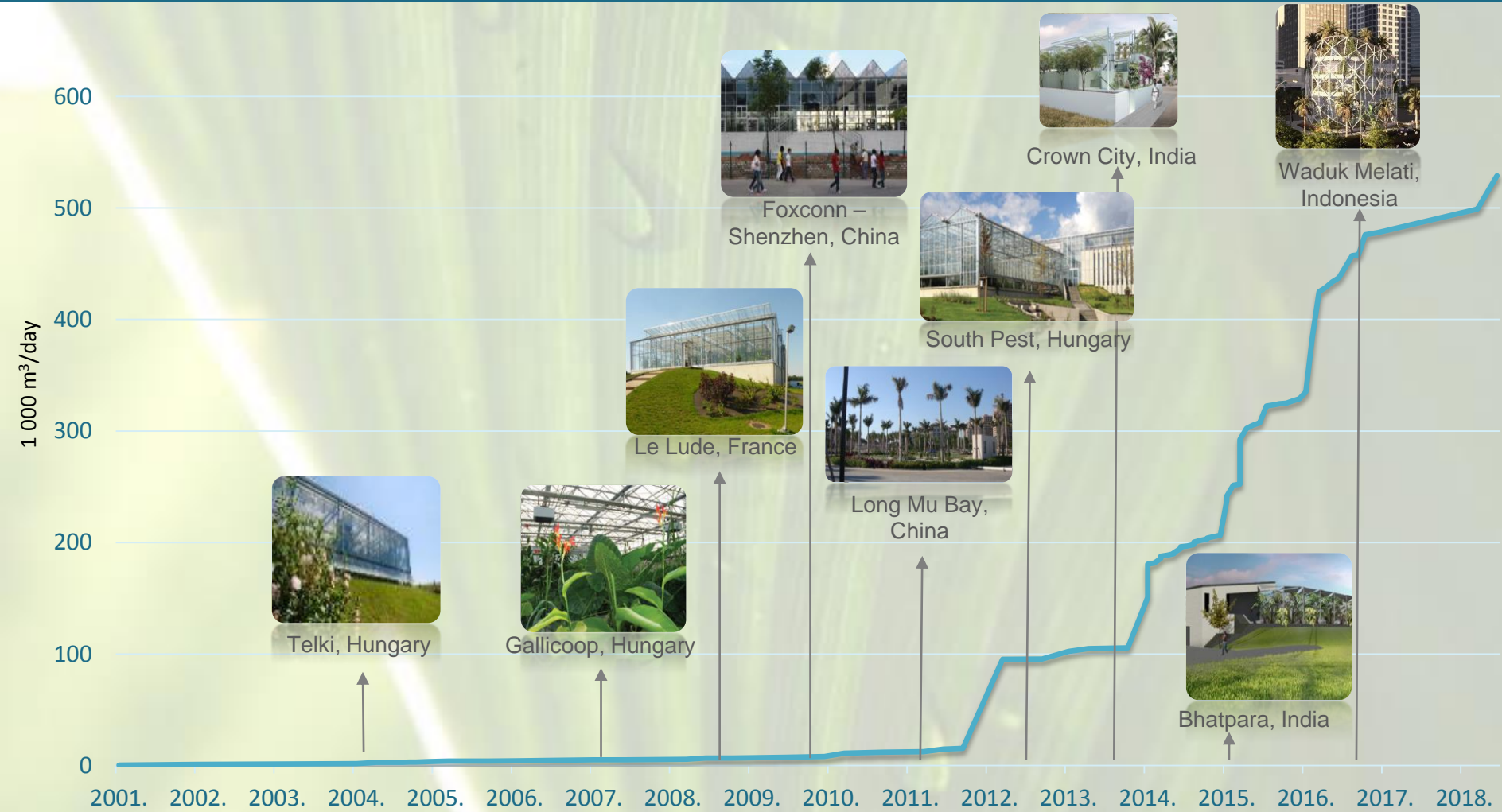


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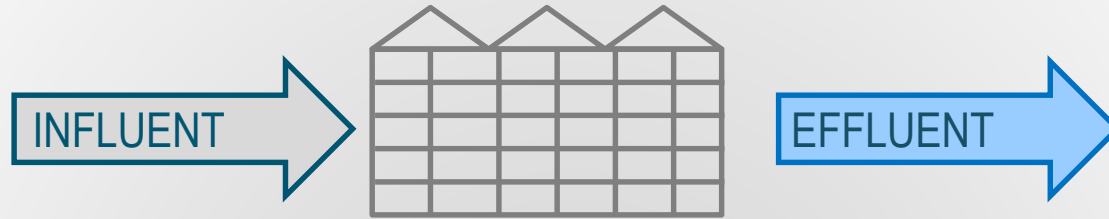
# Organica Applications

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<http://westerntechvn.com.vn>  
Hotline: 024 66736815

# 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)
<b>COD</b>	500-1250	<45
<b>BOD</b>	200-650	<10
<b>TSS</b>	250-800	<10
<b>TN</b>	30-110	<10
<b>Kjeldahl N</b>	30-110	<3
<b>NH4N</b>	90	<0.5
<b>TP</b>	25	<0.5



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



5,000 PE -  
1,000,000 PE

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<http://westerntech.vn.com.vn>  
Hotline: 024 66756815

# Commercial And Campus Systems Can Engage Local Population



Westerntech Vietnam  
<http://westerntechvn.com.vn>  
Hotline: 024 66756815

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



Westerntech Vietnam  
<http://westerntechvn.com.vn>  
Hotline: 024 66756815

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



Westerntech Vietnam  
<http://westerntechvn.com.vn>  
Hotline: 024.66756815

# Industrial Applications



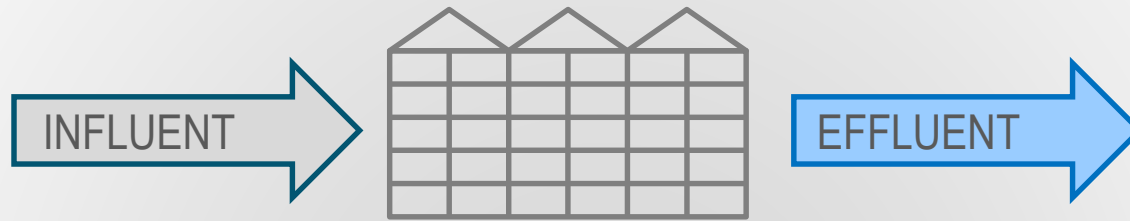
Food Industries

Paper Production

Slaughterhouses

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<http://westerntech.vn.com.vn>  
Hotline: 024 66756815

# Organica FCR Can Treat A Wide Range Of Industrial Influent Conditions



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

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



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<http://westerntechvn.com.vn>  
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# Sampling Of Organica Projects

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<http://westerntech.vn.com.vn>  
Hotline: 024 66756915



# 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

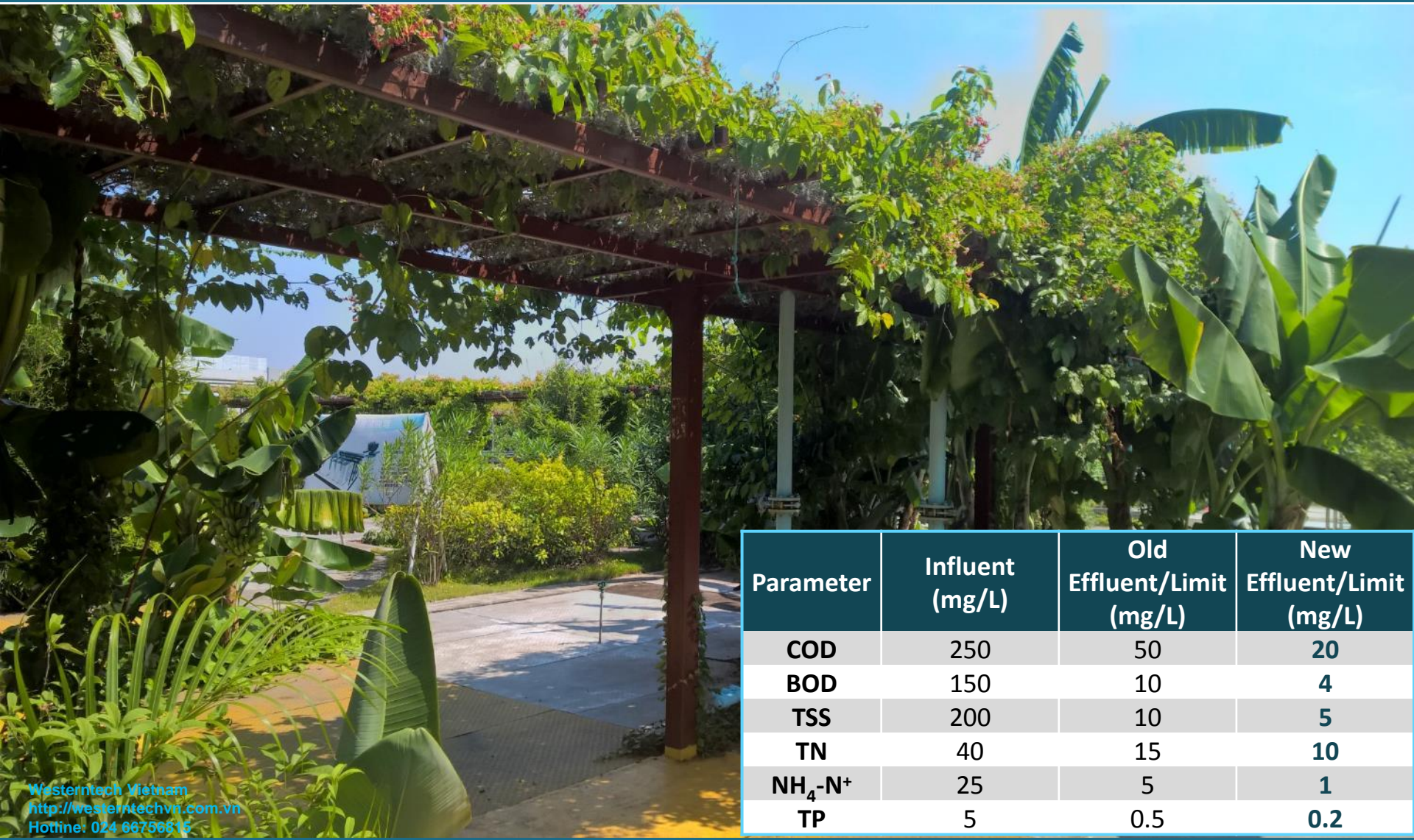
# Example: Consistent Performance

## 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)
<b>COD</b>	250	50	20
<b>BOD</b>	150	10	4
<b>TSS</b>	200	10	5
<b>TN</b>	40	15	10
<b>NH<sub>4</sub>-N<sup>+</sup></b>	25	5	1
<b>TP</b>	5	0.5	0.2

Wastertech Vietnam  
<http://wastertechvn.com.vn>  
Hotline: 024 66756615

# 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%

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<http://westerntechvn.com.vn>  
Hotline: 024 66756815

# Example: Small footprint, environmental value

## Long Mu Bay, China – 40 000 PE



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Hotline: 024 66756815

# Example: Aesthetically pleasing construction

## Aups, France – 9 500 PE



# Greenhouse Enclosure

## Harbor Park, Hungary – 2 800 PE



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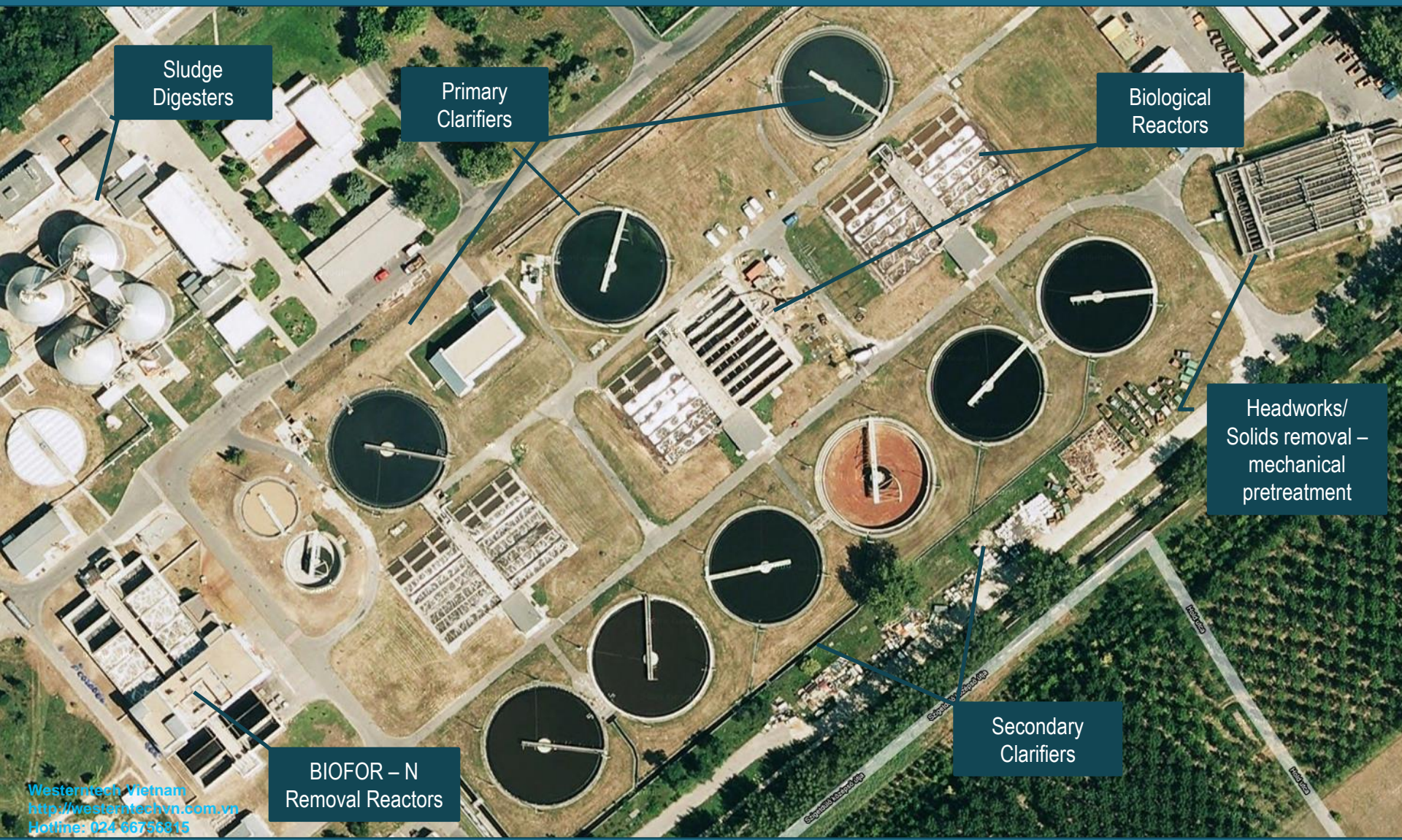
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# South Pest FCR Upgrade

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<http://westerntechvn.com.vn>  
Hotline: 024 66756815



# South Pest Upgrade Treats 80 000 m<sup>3</sup>/day



Sludge  
Digesters

Primary  
Clarifiers

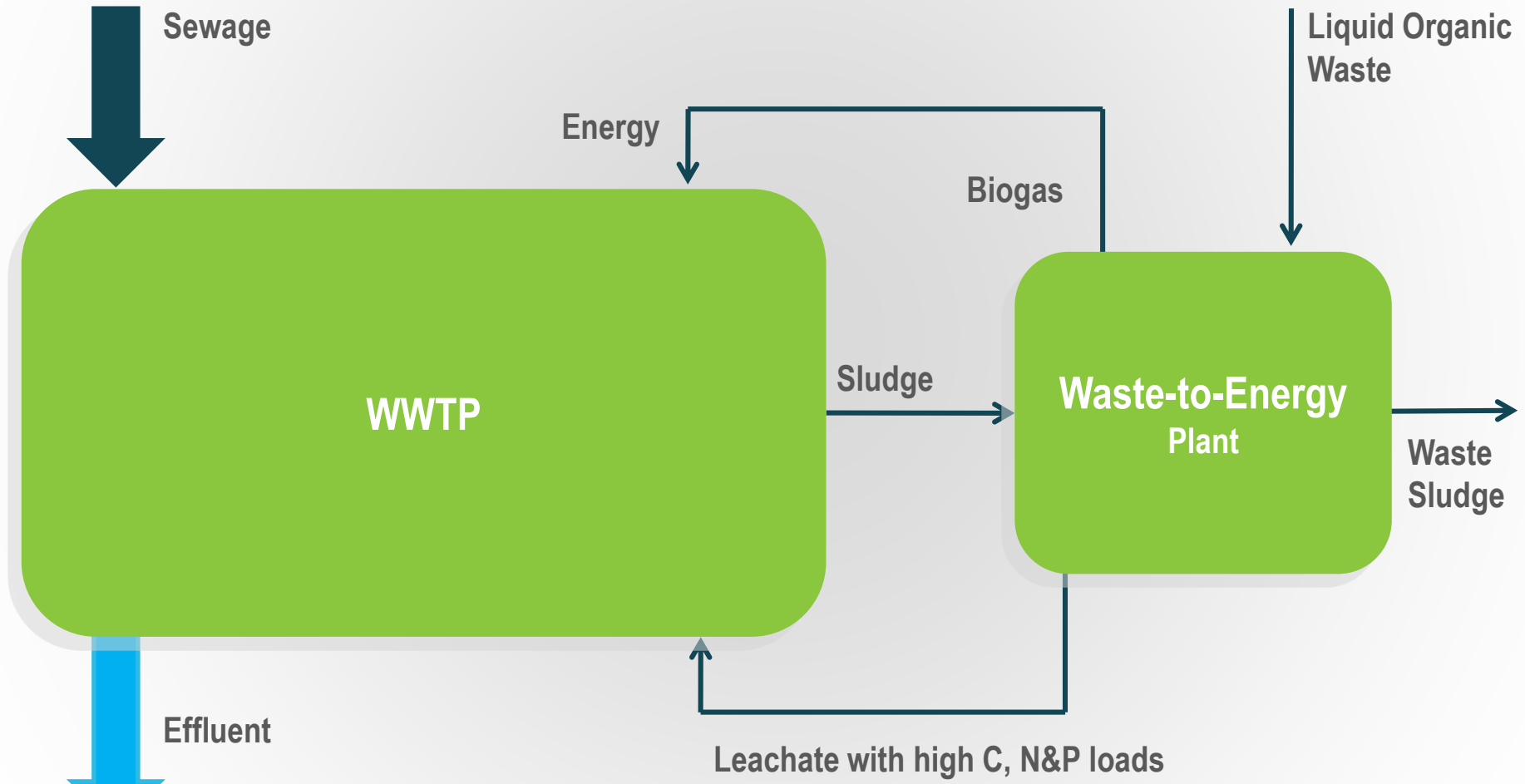
Biological  
Reactors

Headworks/  
Solids removal –  
mechanical  
pretreatment

Secondary  
Clarifiers

BIOFOR – N  
Removal Reactors

# South Pest Simplified Process Scheme



# South Pest Operational Problems

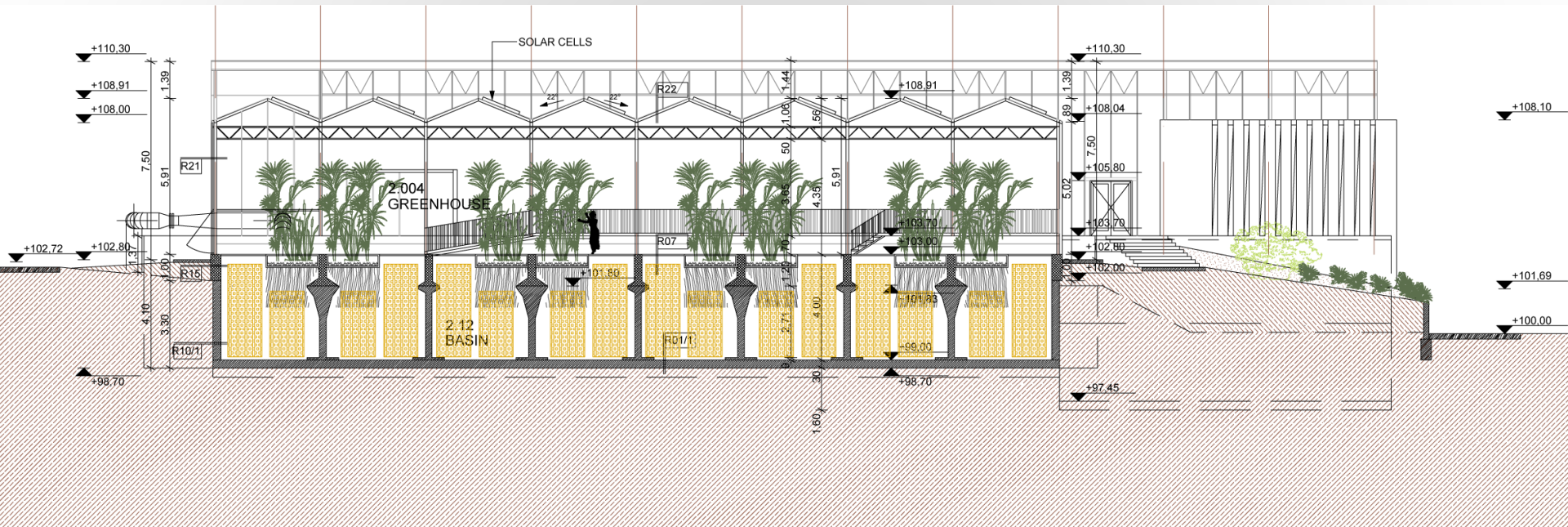


# Organica FCR Upgrade Into Existing Aeration Basins



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<http://westerntechvn.com.vn>  
Hotline: 024 66756815

# Organica FCR Upgrade Utilizing Existing Concrete Infrastructure



# Installation Of Biomodules



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<http://westerntechvn.com.vn>  
Hotline: 024 66756815

# Installation Of Biomodules



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# Installation Of Biomodules



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<http://westerntechvn.com.vn>  
Hotline: 024 66756815



# 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 <sup>3</sup> )	9 085	11 700	+ 30
Biomass Concentration (kg/m <sup>3</sup> )	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



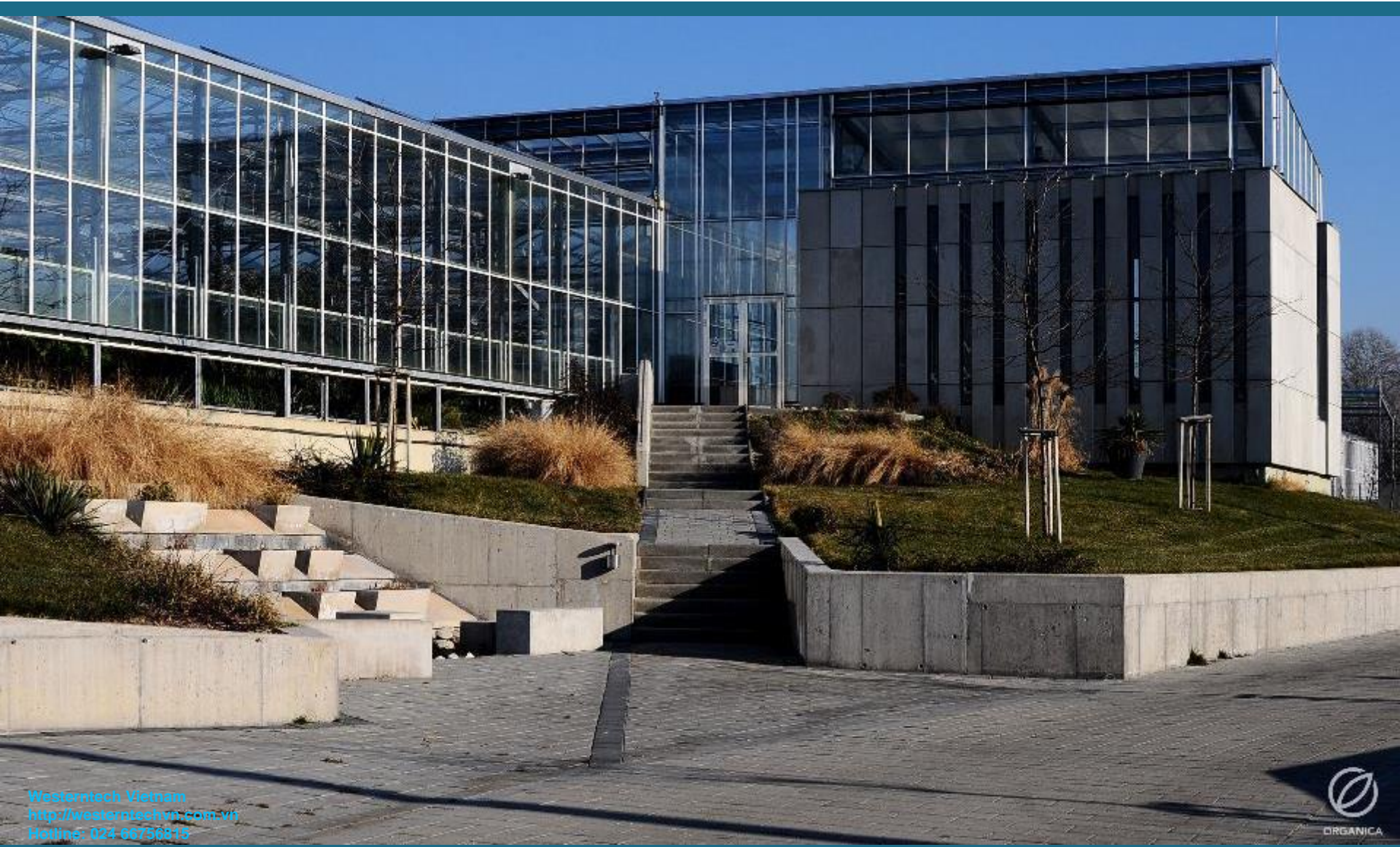
**Before** – concrete activated sludge reactors

Water Tech Vietnam  
<http://www.watertechvn.com.vn>  
Hotline: 024 66756615



**After** - upgrade with Organica FCR

# Aeration Basin Exterior – As Built



WestarTech Vietnam  
<http://www.westartech.vn>  
Hotline: 024 66796819



# Aeration Basin Greenhouse Interior



Westerntech Vietnam  
<http://westerntech.vn>  
Hotline: 024 68756815

# 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 <sup>3</sup> /day	BOD	10
	16,000 – 211,000 gal/day	TN	15
Footprint	Fits on a site as small as 60 m <sup>2</sup> (650 ft <sup>2</sup> )	NH <sub>4</sub> -N	5
		TSS	10
		TP	1

# Organica Bluehouse Applications & Advantages

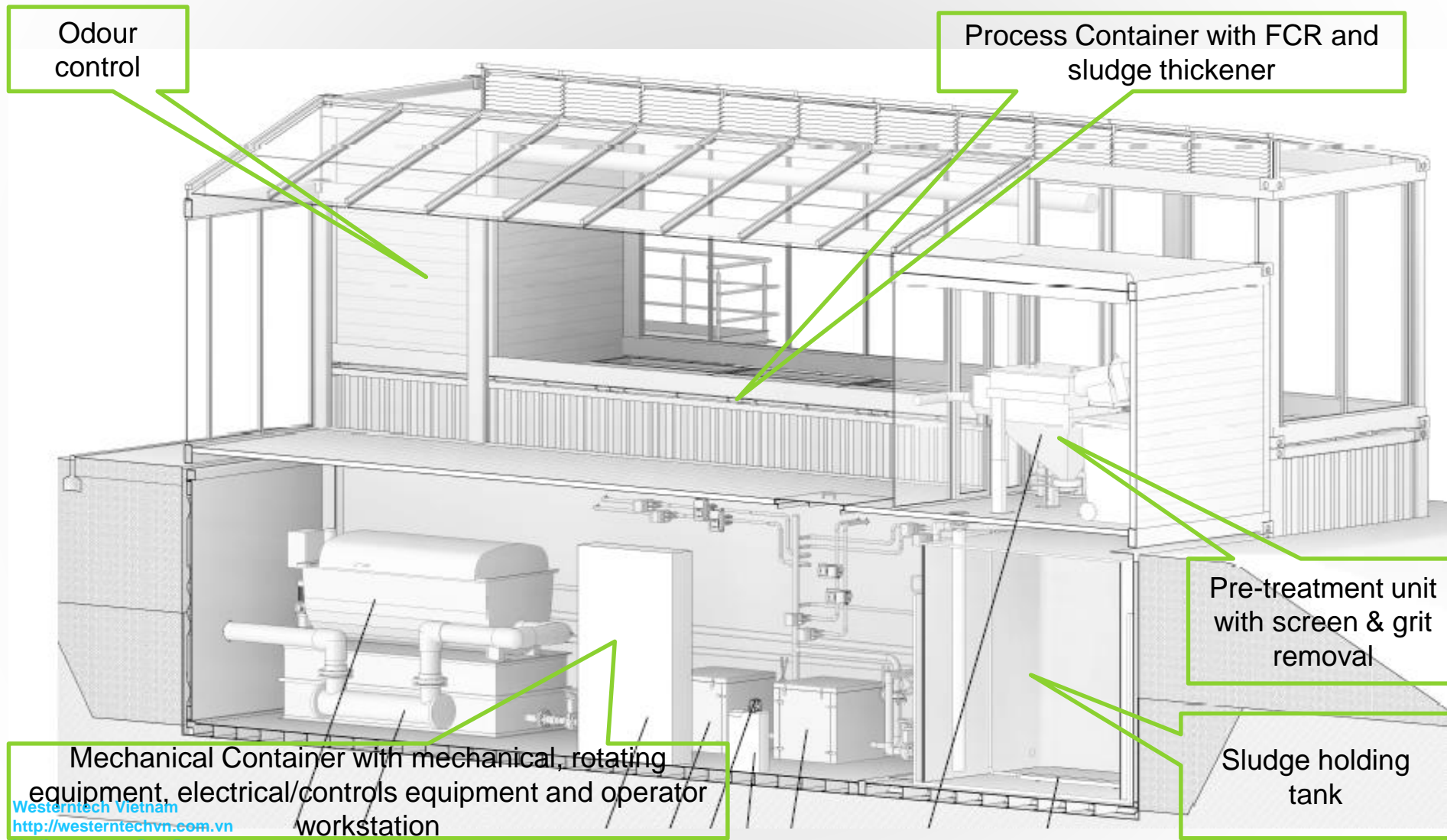


- True Organica solution: **odourless** operation
- **attractive** appearance with **compact** physical footprint
- Pre-designed to allow **rapid manufacturing** and delivery
- Factory-assembled for **easy installation** with minimal site work
- Reliable and **simple to operate** with low staffing needs
- **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

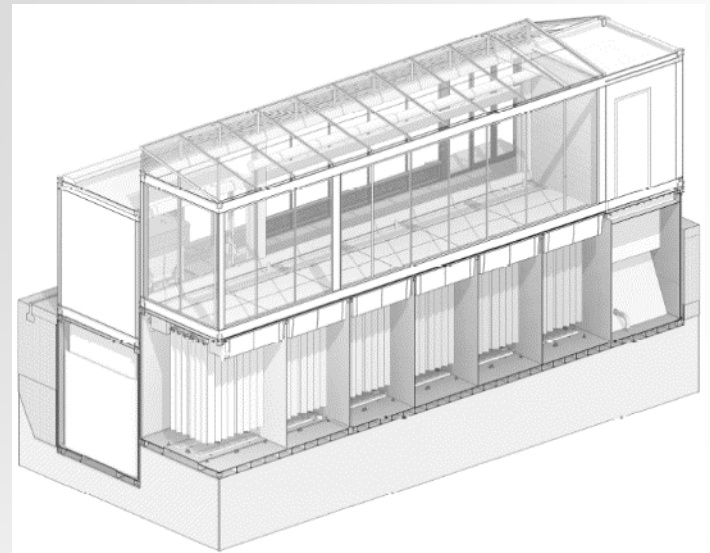
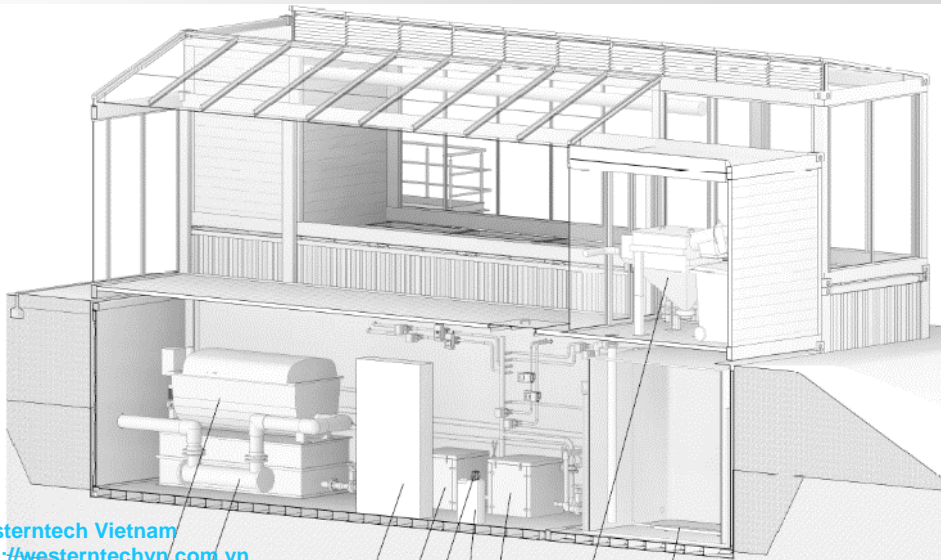
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Hotline: 024 66756815



# Cross Section of an Organica Bluehouse

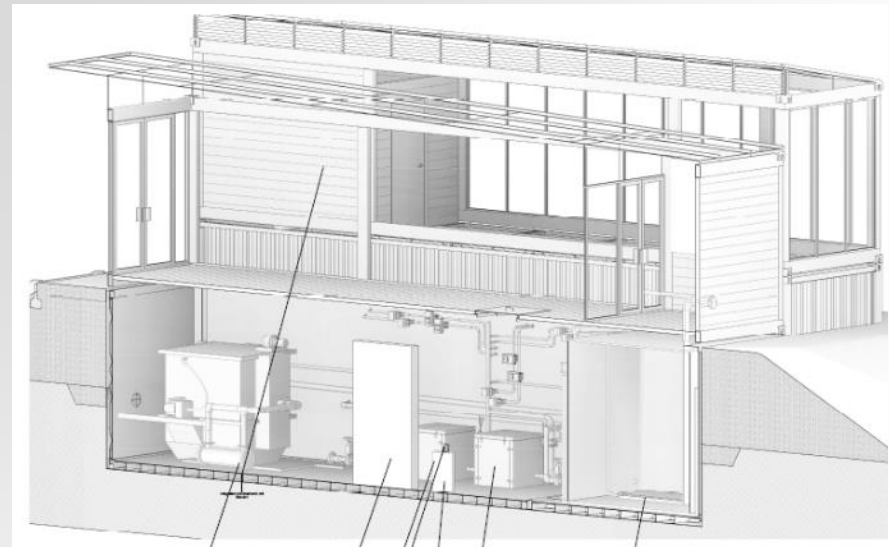
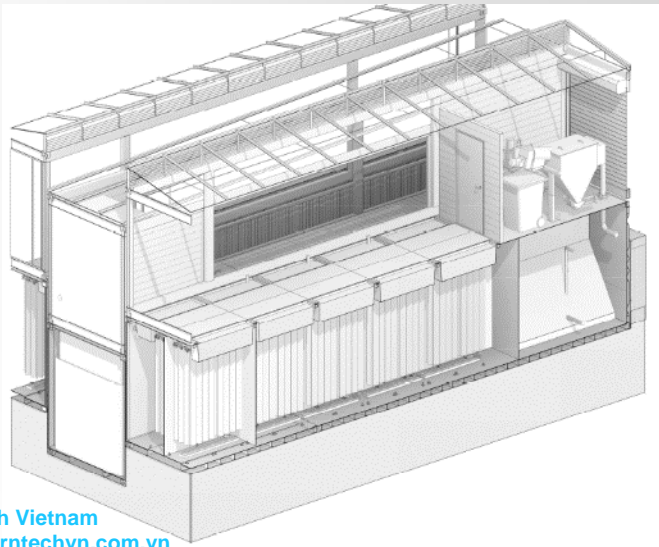


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# Vision of the Future – Water Reclamation Gardens



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