

**A Circular Economy-
transforming non-degradable medical waste into life saving
water filtration and disinfection solutions**

NUF

THE NUF® TECHNOLOGY - TRANSFORMING ULTRAFILTRATION TO
BEST AVAILABLE AFFORDABLE TECHNOLOGY (BAAT) FOR WATER TREATMENT

Lior Koller— Sales Manager
lior@nufiltration.com
+972 54 6764042



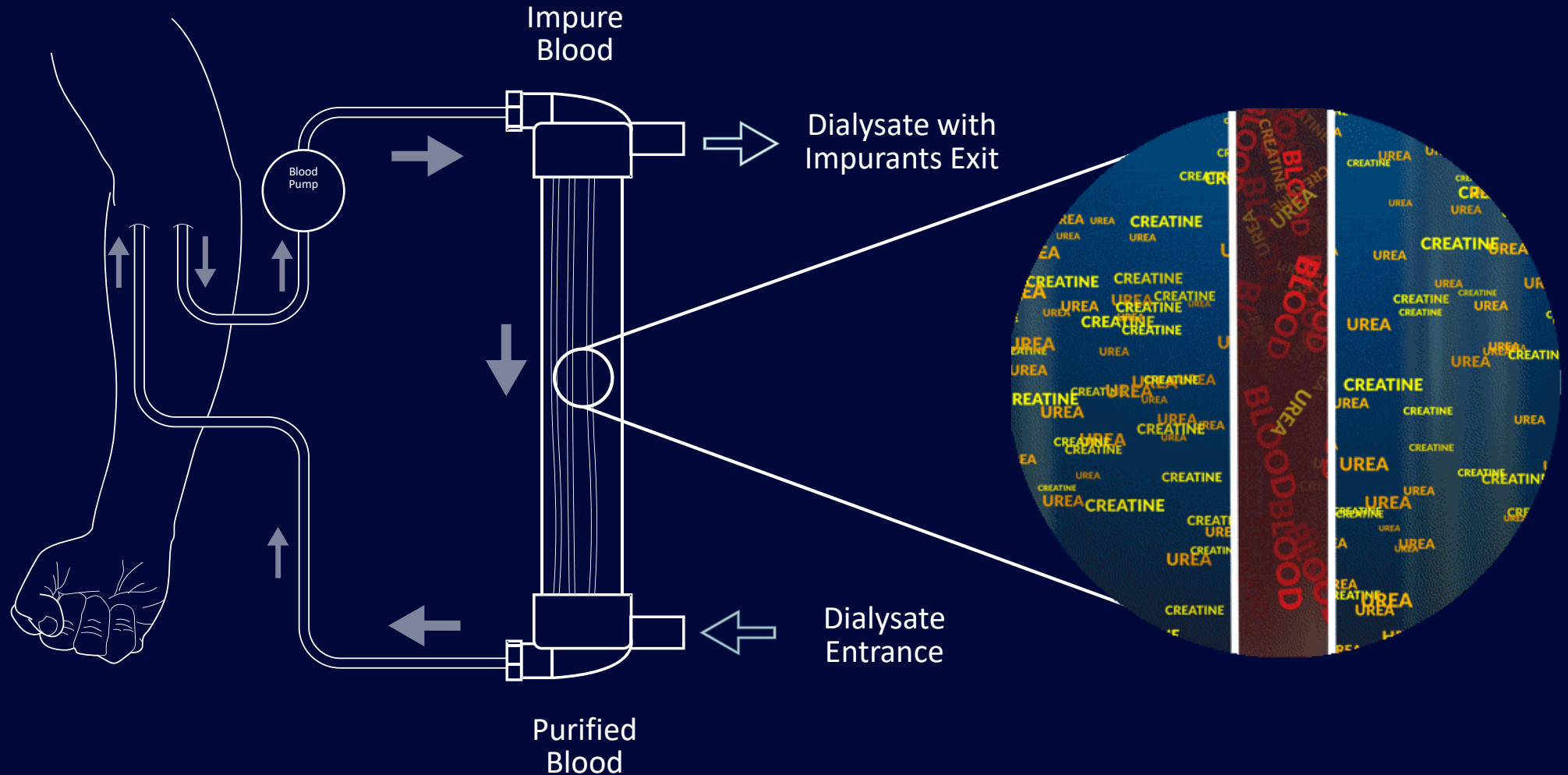
NUF[®] – advanced water disinfection solutions

- NUFiltration is an Israeli-Italian water-technology company.
- NUF[®] systems are engineered and built in Israel & Italy by NUFiltration.
- The core of NUF[®] systems are NUF-membranes which are medical UF (Ultra-Filter) membranes, designed to perform as “artificial-kidney”.
- As medical devices, NUF-membranes do not compromise on quality and performance.
- Hundreds of NUF[®] systems are already commercially installed in over 30 countries.
- NUF[®] systems offers unparalleled cost-performance.

Dialyzer
is a medical Grade device
Dialyzer = Artificial Kidney



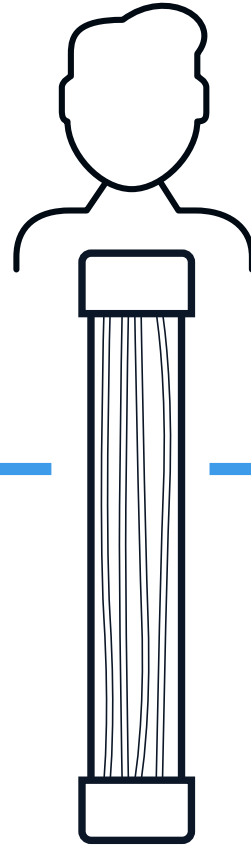
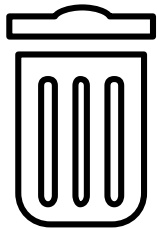
MEDICAL DEVICE USED FOR HEMODIALYSIS



After One Use - HAVE 2 OPTIONS ONLY:

OPTION A:

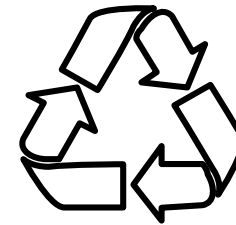
Non Degradable
Medical Waste -
for landfill.
(≈95%)



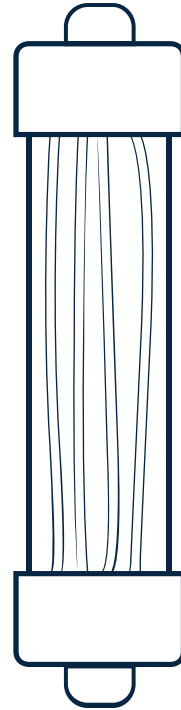
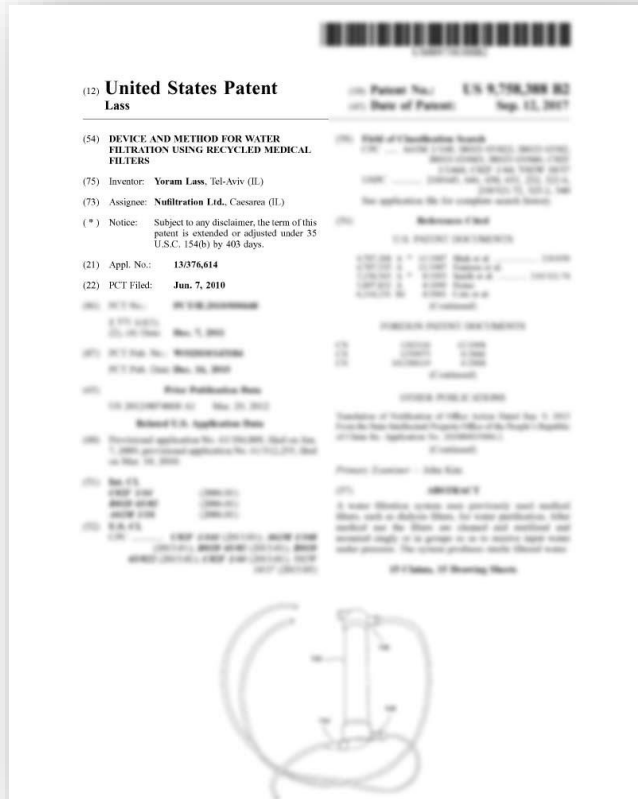
≈250,000,000
Unit per year!!!

OPTION B:

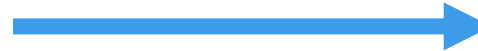
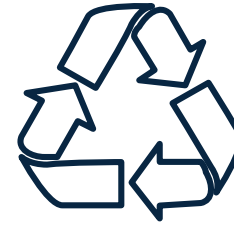
Reprocessing for
one more use
(Only To the same patient!)



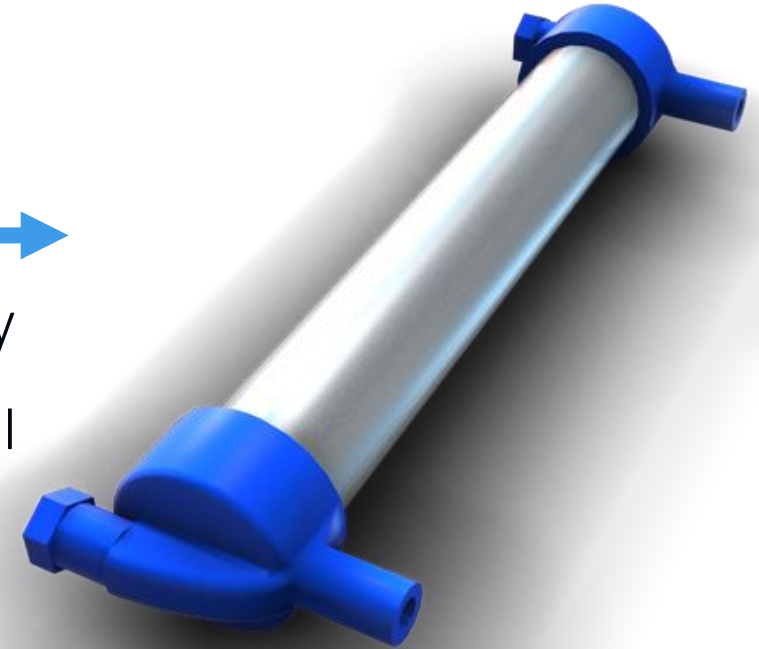
THE PATENT



From a medical
grade device

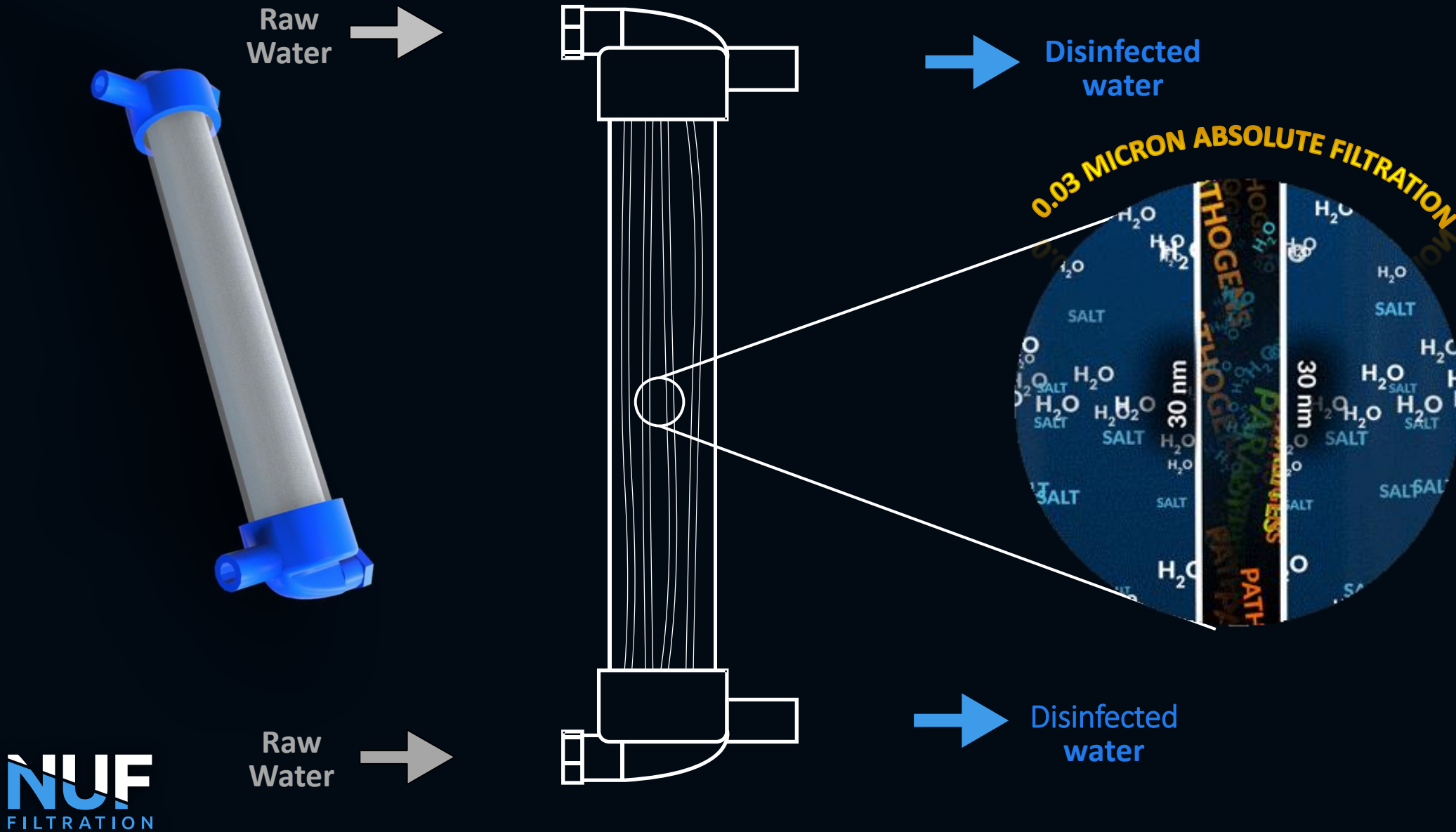


Reprocessing by
sterilization as
per ANSI / AAMI
standard

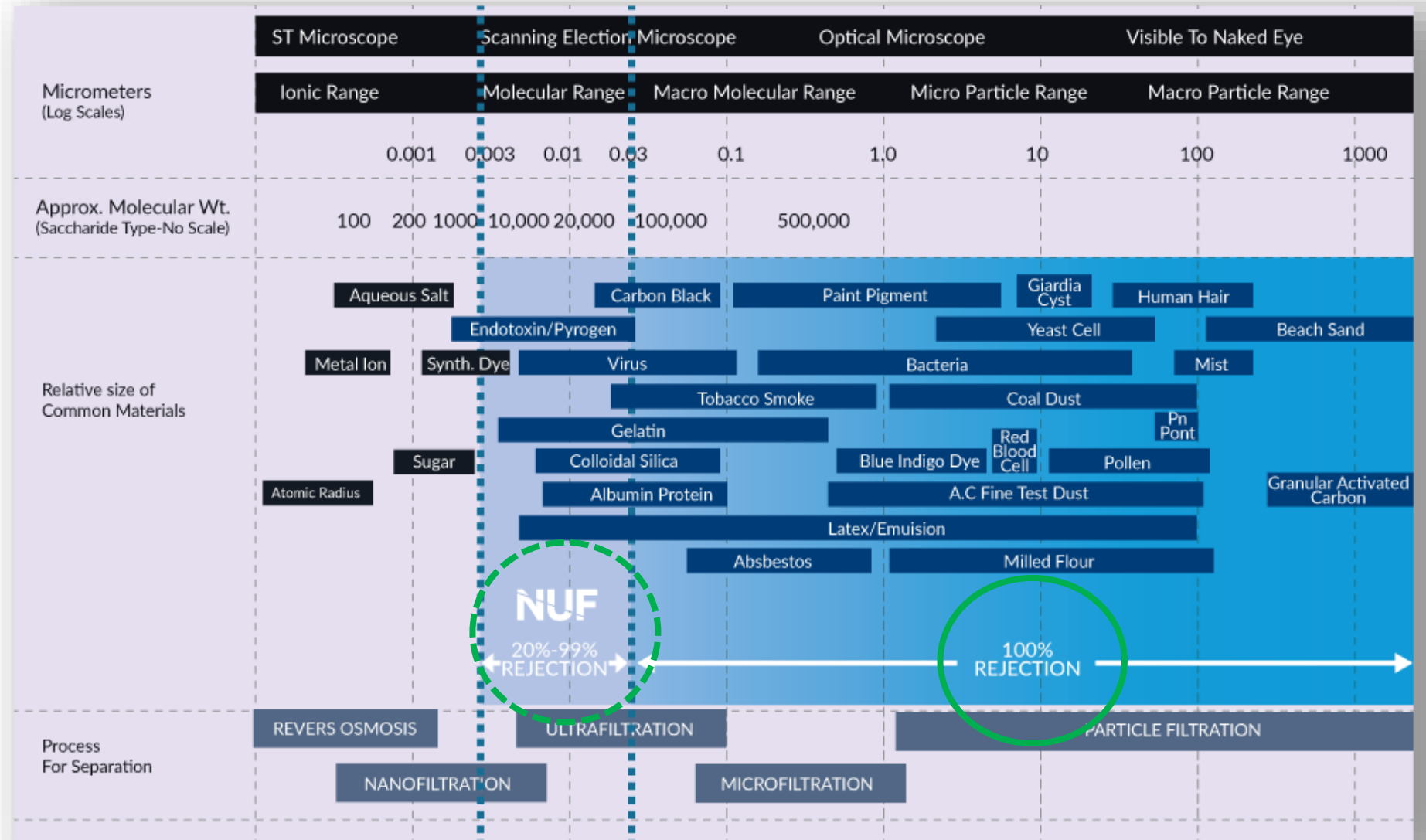


To a water
Ultra filter

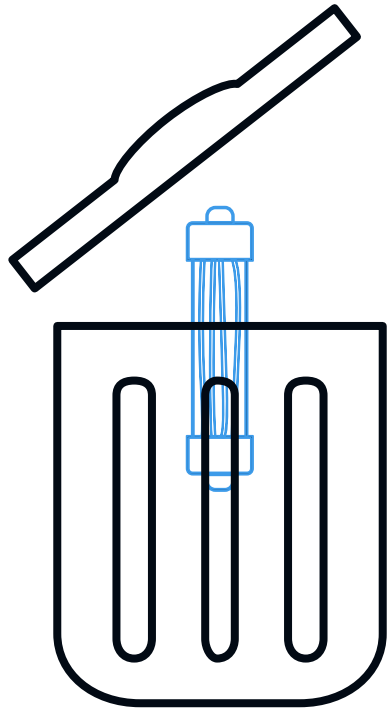
To NUF[®] membranes WATER ULTRA FILTER



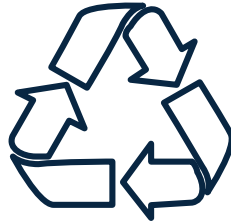
NUF ON THE FILTRATION SPECTRUM



THE ESSENCE OF CIRCULAR ECONOMY:

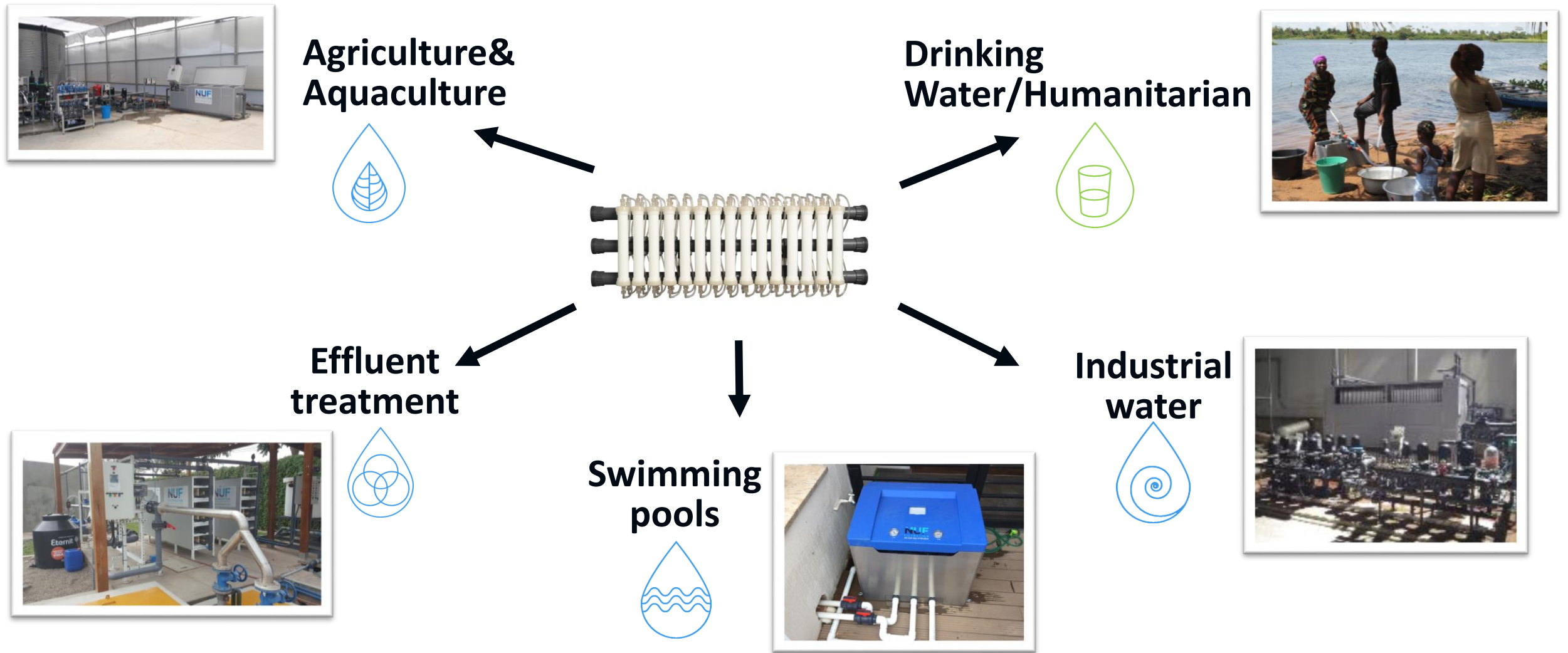


**TRANSFORM A
WASTED PRODUCT OF
NO VALUE**



**INTO AN EVEN MORE
VALUABLE PRODUCT**

NUF® Up To Scale for Variety of applications



MAIN APPLICATION



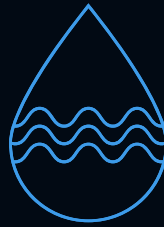
AGRICULTURE

- Water Recycling in Greenhouses
- irrigation Firewall
- Water Recycling in fish and algae farms



DRINKING

- Iron and Manganese removal
- Surface water treatment and purification



POOLS

- Swimming pool water treatment



EFFLUENTS

- Class A effluents upgrading
- Grey water treatment and recycling



INDUSTRIAL

- Industrial Ultrafiltration and liquid separation processes
- Cooling water treatment
Pretreatment before Reverse Osmosis plants

DRINKING

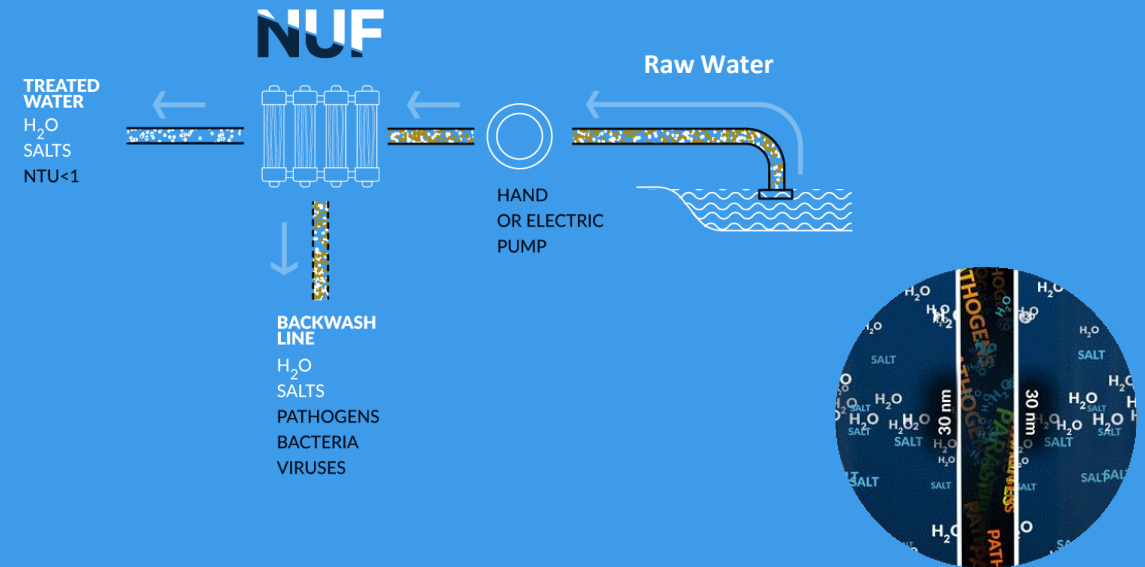


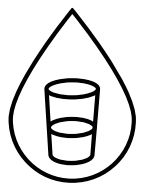
DRINKING WATER



DRINKING WATER

The NUF® systems efficiently remove suspended solids, pathogens, bacteria, viruses and organic matters from surface (lake, river, pond, etc.) and/or borehole water in one single pass, thanks to the 0.03 μ absolute filtration rate of the NUF® membranes. Raw water enters the system at low pressure while the purification process takes place by simple mechanical size exclusion on the membranes – without use of chemical or biological treatment. Water and dissolved salts permeates the membrane as purified treated water. Out of the treated water, a minimal percentage of water (1%-5%) is used for a self-actuated built-in periodical membranes backwash, where all the pollutants are expelled.





DRINKING WATER

MAIN FEATURES

- ✓ Compact water treatment systems, skid mounted in a "plug-and-play" modular mode, from 0.25 to 1,000 m³/hr capacity
- ✓ Autonomous units activated by hand-pumps (up to 0.5 m³/hr capacity) – no electricity needed
- ✓ Fully automated units with electrical pumps (connection to the grid or generator)
- ✓ Solar- energy fully automated self-sustainable powered units (0.5-10 m³/hr)
- ✓ Compact and modular – reduced footprint
- ✓ Affordable installation cost
- ✓ Reasonable operational cost



APPLICATIONS

- Drinking water production in remote areas
- Emergency response kits
- River water purification for villages, towns, etc.
- Best RO desalination pretreatment units: one single pass on the NUF unit replaces the use of flocculation, chlorination, sand filtration, de-chlorination and cartridge filtration – while producing RO feed at SDI < 2





Portable manual Unit

NUF-500



Hand-held unit (weight≈15 Kg) can provide drinking water to a village of 300-400 people, electricity-free



DRINKING WATER-Mobile systems





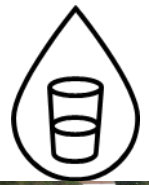
DRINKING WATER-Containerized Systems





DRINKING WATER-NUF solar energy systems

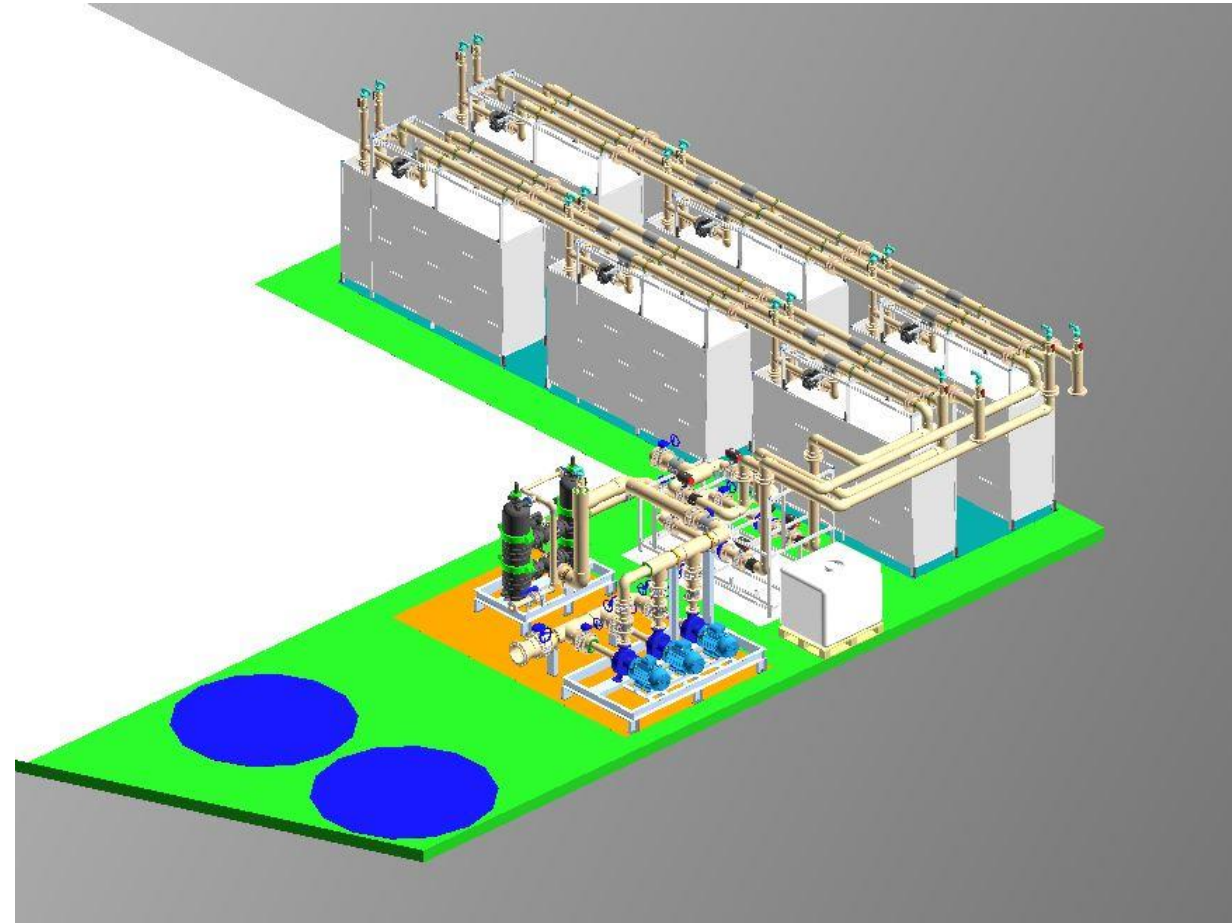




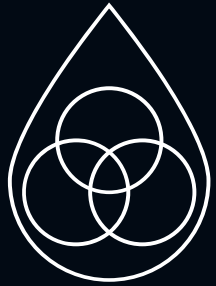
DRINKING WATER-NUF - Big Projects



Drinking water purification System – 240 m³/h - Colombia

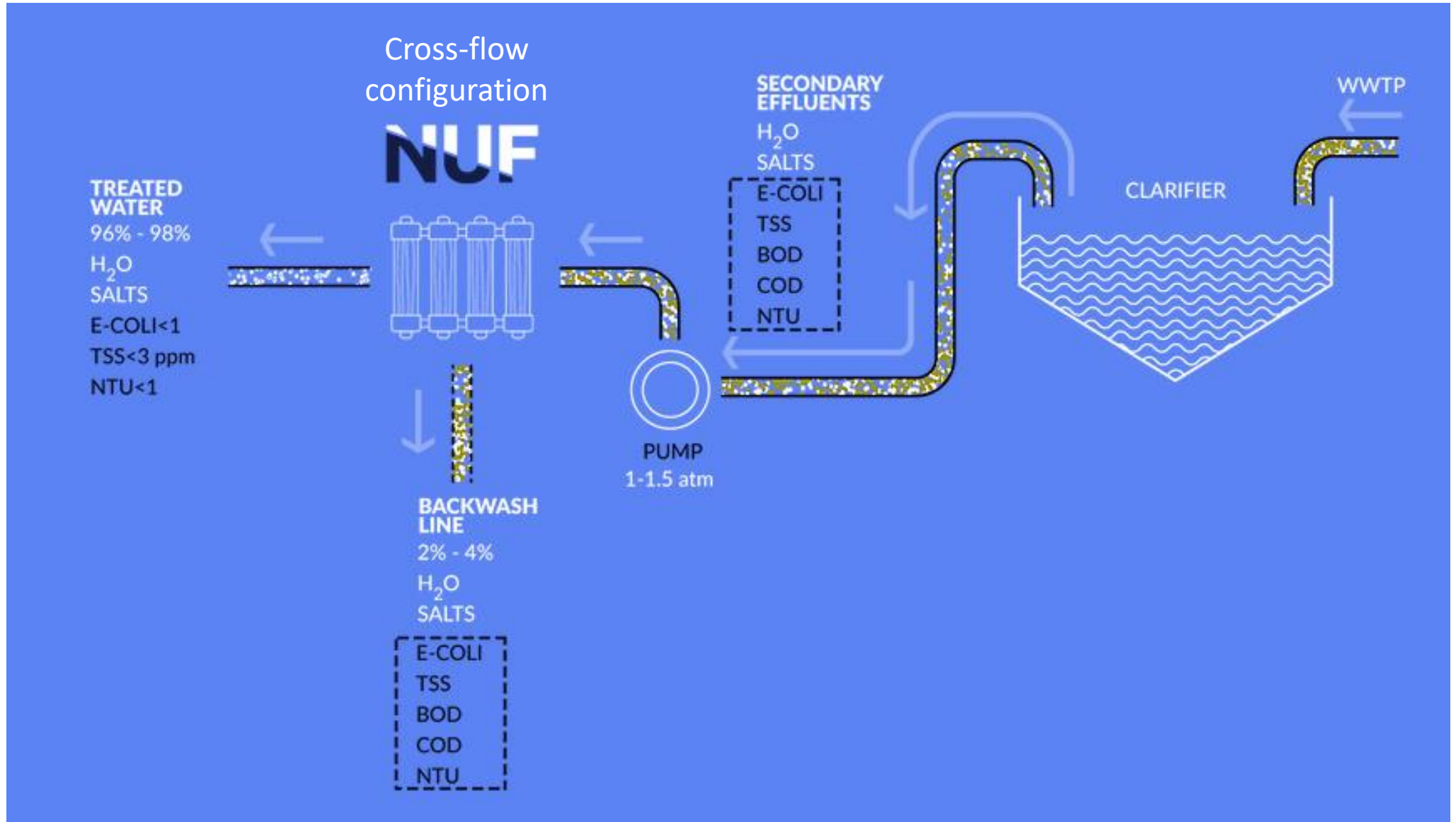


EFFLUENT



TERTIARY & QUATERNARY TREATMENT

NUF[®] technology applied in effluent treatment



Tertiary treatment and reuse of **Effluents**



Mezar (Israel) 130 m3/h WWTP

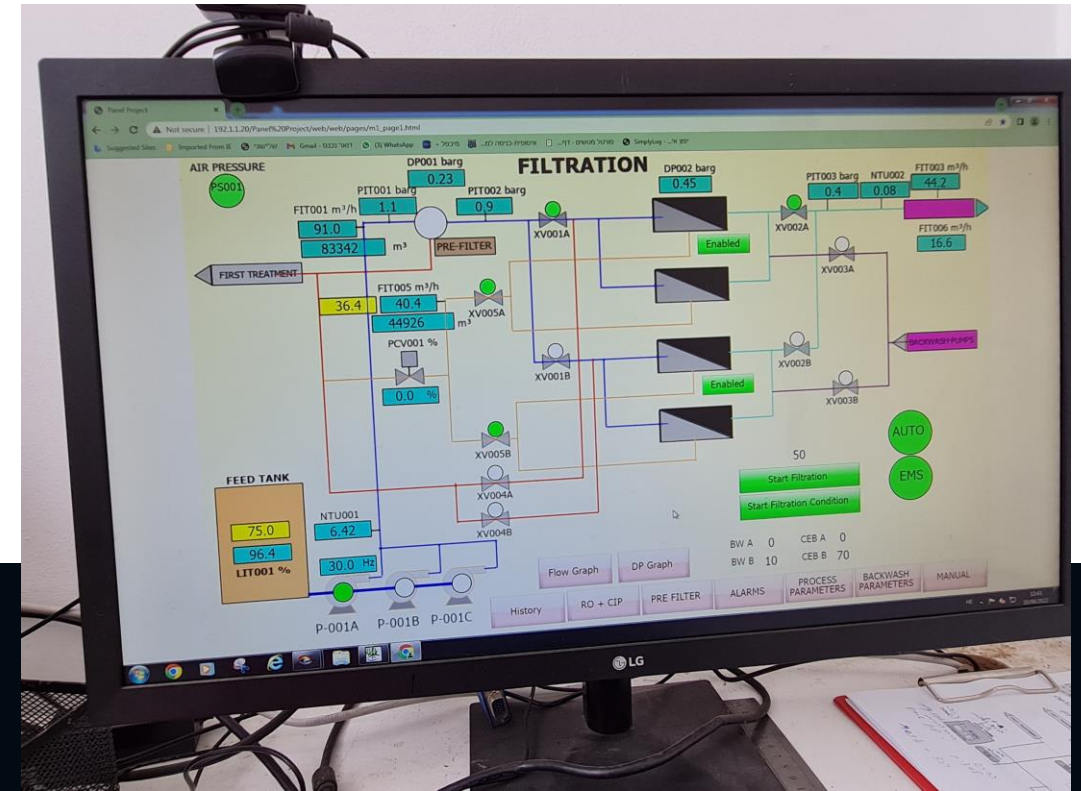
Permeate Results:

E-coli < 1 . 8 (none)

TSS < 2 . 5 (none)

NTU < 0.2-0.7 max.

BOD < 5



WWTP: Southern France

NUF permeate:



Back wash from the NUF:



Horodateur	Durée de la période (en J)	Volume Filtré (m3)	Volume Backwas h (m3)	Pression Différentielle (bars)	Débit Instantané Entrée NUF (m3/h)	Turbidité (NTU)			MES (mg/l)		Amont Filtre		Sortie NUF	
						Amont Filtre	Aval Filtre	Sortie NUF	Amont Filtre	Sortie NUF	Coliformes totaux (nb/100ml)	E. Coli (nb/100ml)	Coliformes totaux (nb/100ml)	E. Coli (nb/100ml)
3/17/2020 9:39:33	1.0	96	2	0.31	8.12									
3/18/2020 9:49:59	1.0	70	2	0.32	7.8	2.79	2.72	0.22			2419	3	3	0
3/19/2020 14:15:25	1.2	88	3	0.22	6.8	1.63	2.47	0.44	5.3	0.6				
3/20/2020 13:50:04	1.0	35	1	0.24	7.12	1.35	1.52	0.14	1.6	0.1	2419	2	4	0
3/23/2020 9:15:13	2.8	0	0	0.24	7.12	1.35	1.52	0.14	1.6	0.1	2419	2	4	0
3/23/2020 9:17:21	0.0	35	1	0.21	7.03	5.59	5.73	0.37						
3/24/2020 8:37:06	1.0	23	1	0.31	7.3	2.95	3.4	0.13						
3/25/2020 14:08:43	1.2	41	1	0.30	7.3	2.64	3.8	0.26	2.4	0.4	2419		4	0
3/26/2020 9:03:37	0.8	86	2	0.28	7.3	2.89	3.14	0.22						

Tertiary treatment and reuse of **Effluents**



Yagur WWTP- NUF: in-out photo comparison

Permeate Results:

E-coli < 1 . 8 (none)

TSS < 2 . 5 (none)

NTU < 0.2-0.7 max.

BOD < 5

WWTP: Modi'in region , 36 m³/hr



BW from the
NUF:

20 NTU – secondary
effluent:

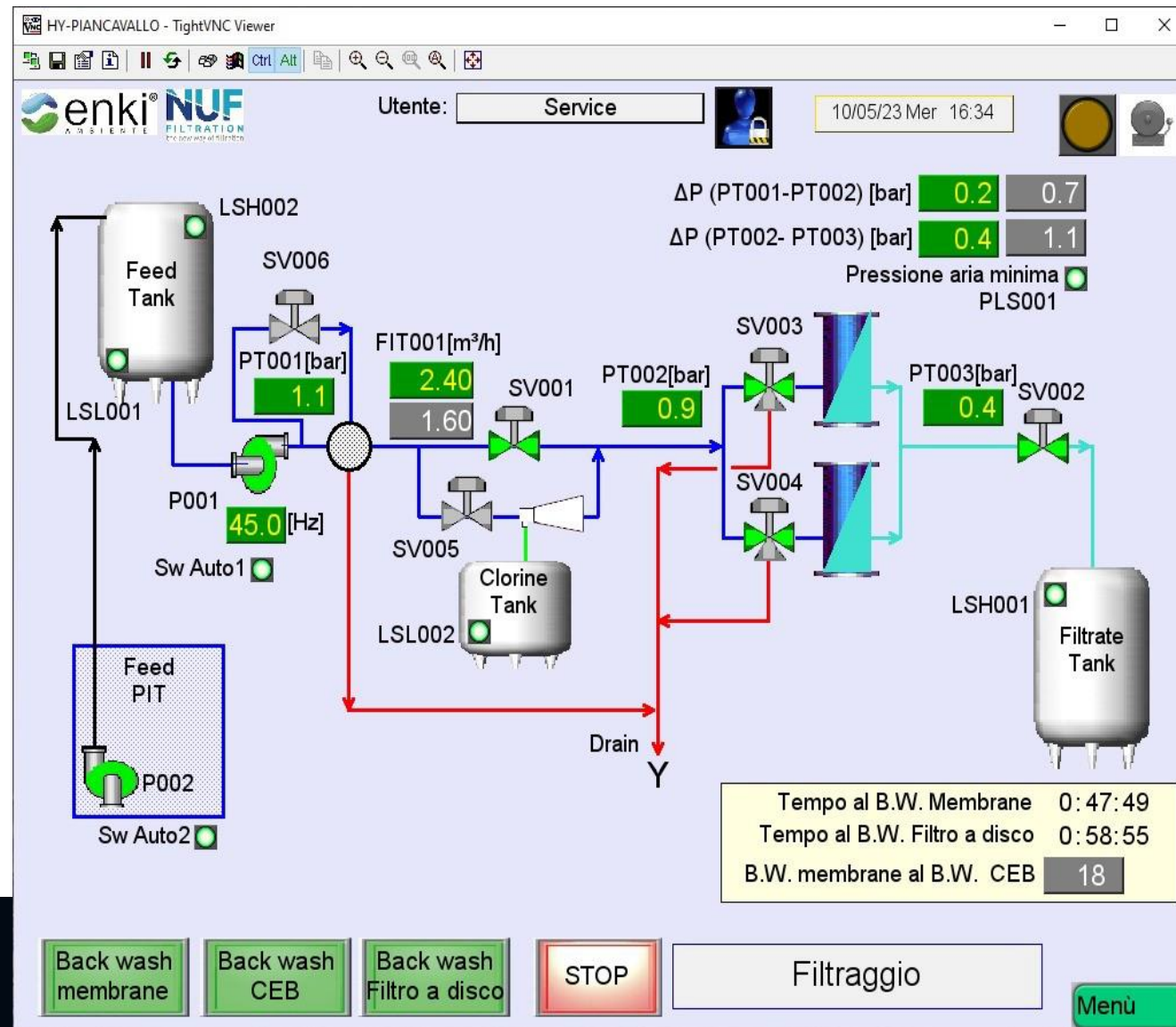
0.06 NTU –
NUF permeate



PIANCAVALLO (PN) ITALY – effluent upgrading

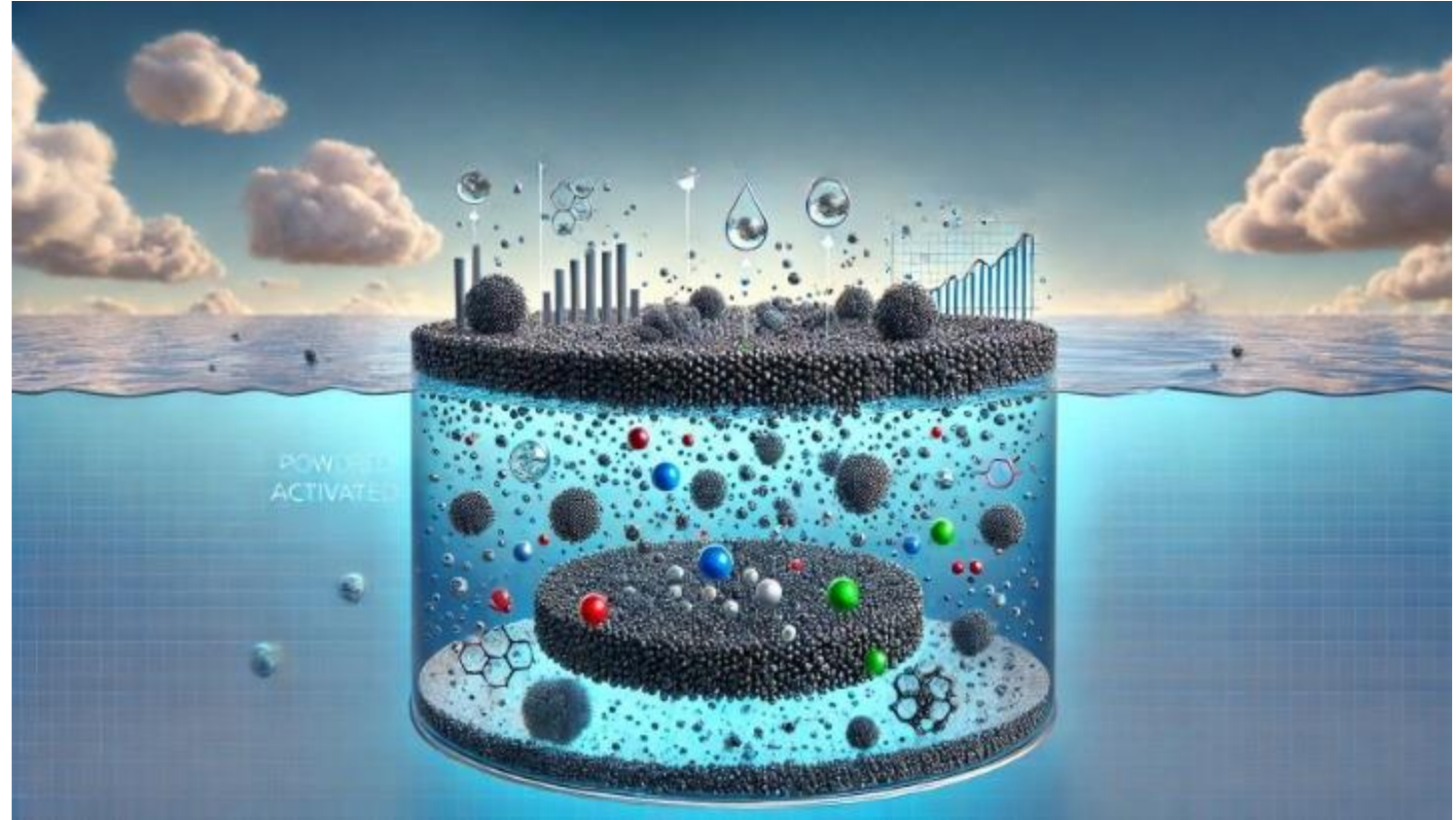
HydroGEA

servizio idrico integrato

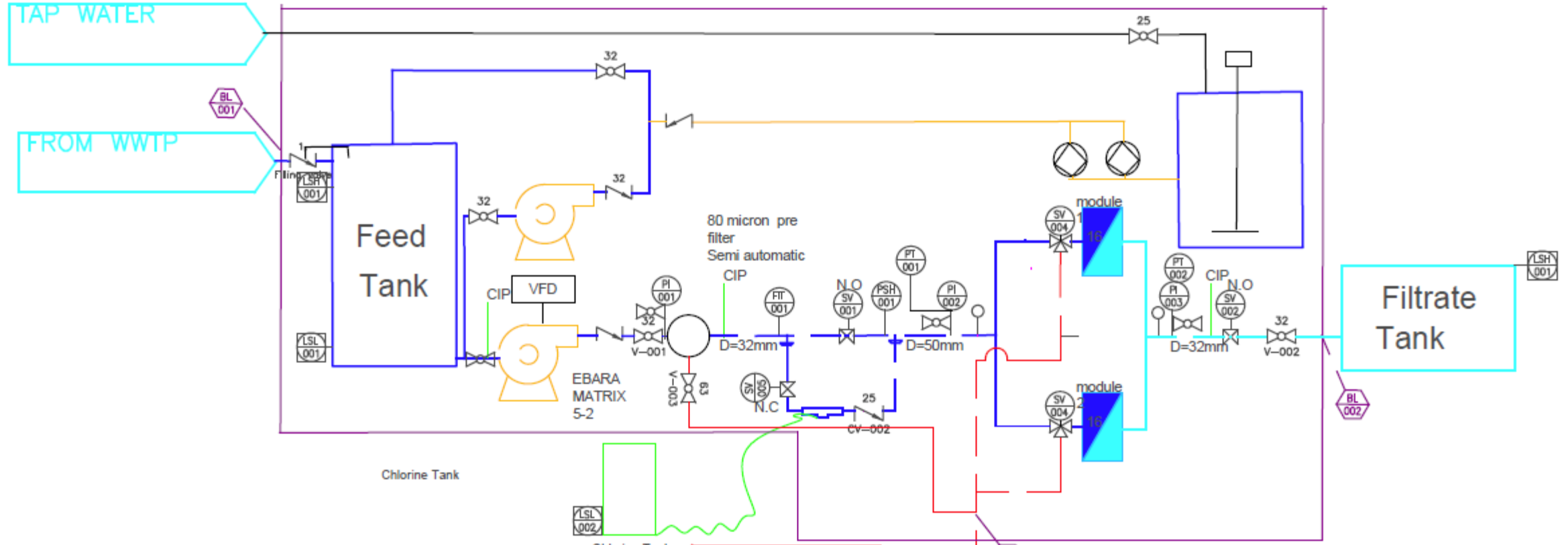


Adsorption of micropollutants by Powdered Activated Carbon (PAC)

- PAC consists of fine particles of activated carbon, enhancing its ability to effectively adsorb diverse micropollutants in water
- Its highly porous structure increases surface area, facilitating greater adsorption capacity compared to larger carbon forms
- PAC utilizes physical and chemical interactions, primarily van der Waals forces and hydrogen bonding respectively, to attract and retain various micropollutants



PAC – NUF typical plant flow diagram



Pilot plant – 10 m³/hr – in collaboration with MM (Metropolitane Milanesi SPA) – at Nosedo (MI) WWTP



- A: Dosing of PAC for the adsorption of micropollutants
- B. Filtration and Disinfection by NUF membranes unit



INDUSTRY USES THE BEST AFFORDABLE WATER TREATMENT FOR INDUSTRIAL USES



NUF for Cooling tower water treatment

Cooling water contamination may be caused from a few possible sources:

- Low-quality make-up water such as treated wastewater or river water.
- Contaminants whose source is the air entering the tower (dust, insects, industrial exhaust) .
- Contaminants whose source is a breach or leak from the industrial process (releasing contaminants) into the cooling water
- Contaminants in the cooling water itself, such as salts, organic contaminants, and corrosion

Apart from protecting the system components, mechanical filtration lowers operating costs by:

- **Saving on chemicals** – Anti-corrosives and anti-scaling compounds attach themselves to suspended particles in the cooling water instead of to system parts; removal of the particles therefore reduces the quantities of chemicals needed.
- **Saves work** – The suspended particles in the cooling water constitute “condensation nuclei” for buildup of minerals and biological contaminants that later settle in the tower pool or in areas where water flow is slow (heat exchangers); these must then be removed manually.
- **Saves energy** – Blockage and coating of the heat exchange surfaces (heat exchanger, tower fill) reduces the cooling system’s efficiency and hence increase the power consumption.
- **Saves part replacements** – Preventing settling and buildup of organic matter and minerals on the system components reduces or prevents having to replace them due to blockages
- **Saves make-up water** – Enables operation in a larger number of cycles.

NUF for Cooling tower water treatment

Increasing electrical efficiency: by preventing accumulation of biofilm on the heat exchanger

Reducing usage of chemicals: as a consequences of the NUF filtration level of 3 nm, all pathogens will be removed from the water mechanically

Filtration and disinfection in one single pass : Enhancing the aspect of environmental conservation and reduction in biocides and chemicals in the factory.

Legionella : the NUF will filter out legionella completely





CASE STUDIES

- *Project name*: Cooling Towers TLV Airport
- *Location*: Israel
- *Water Source*: Cooling tower water
- *Project goal*:
Reduction of organic and microbial contaminants
Reduction in Chemical Consumption
Optimization of Energy Efficiency
- *Total Water Volume* : $\approx 100 \text{ m}^3$
- *Circulation Flow Rate*: $\approx 1,600 \text{ m}^3/\text{h}$
- *Pretreatment Flow*: $80 \text{ m}^3/\text{h}$
- *NUF System Flow*: $40 \text{ m}^3/\text{h}$



The logo for NUF Filtration features the letters 'NUF' in a large, bold, sans-serif font. The 'N' and 'U' are blue, while the 'F' is white. Below 'NUF', the word 'FILTRATION' is written in a smaller, white, all-caps, sans-serif font.

NUF

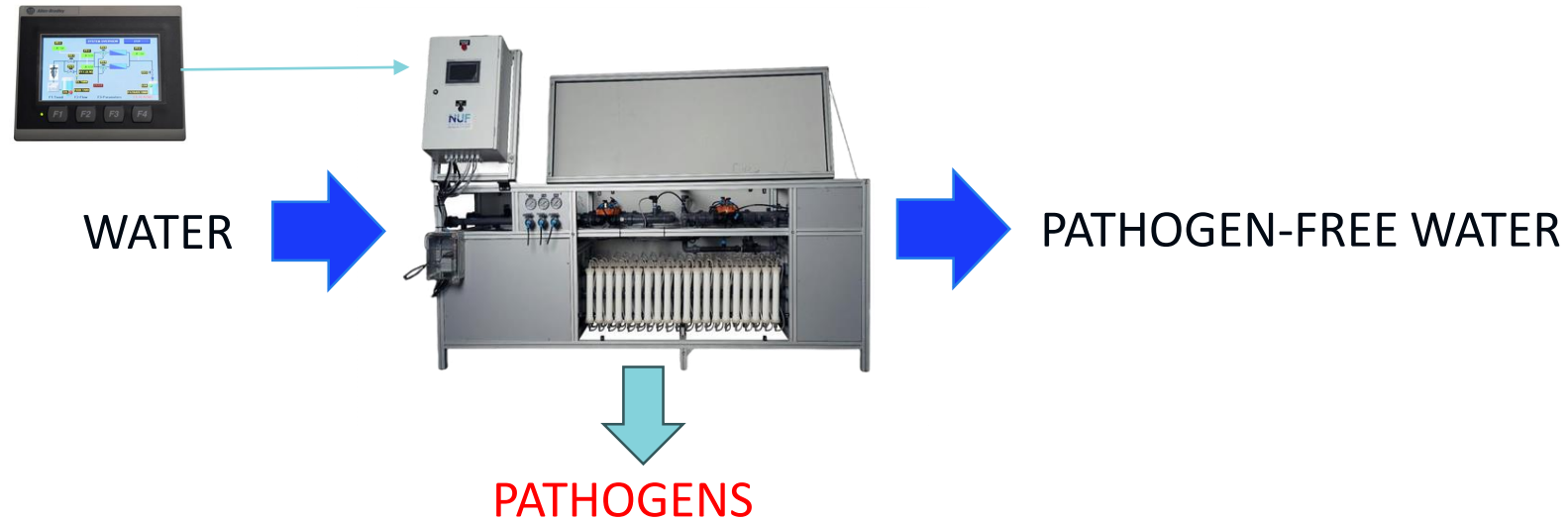
FILTRATION

AGRICULTURE

**Filtration & disinfection in one single pass
for Hydroponics, Vertical farming, Indoors & Outdoors
applications**

NUF® Principle of operation

Physical rejection of pathogens



- ✓ **Physical separation** of pathogens without using chemical, thermal, or biological treatment
- ✓ Filtration and Disinfection **in a single pass, undistruptive to the water and to the crop**
- ✓ Recovering $\geq 98\%$ of water, $\geq 98\%$ of nutrients, $\geq 98\%$ of micro elements (**undistruptive to water content**)
- ✓ **Zero footprint** to the crop
- ✓ Built-in **automatic pre-filter**
- ✓ Minimal, almost no-cost, energy requirements

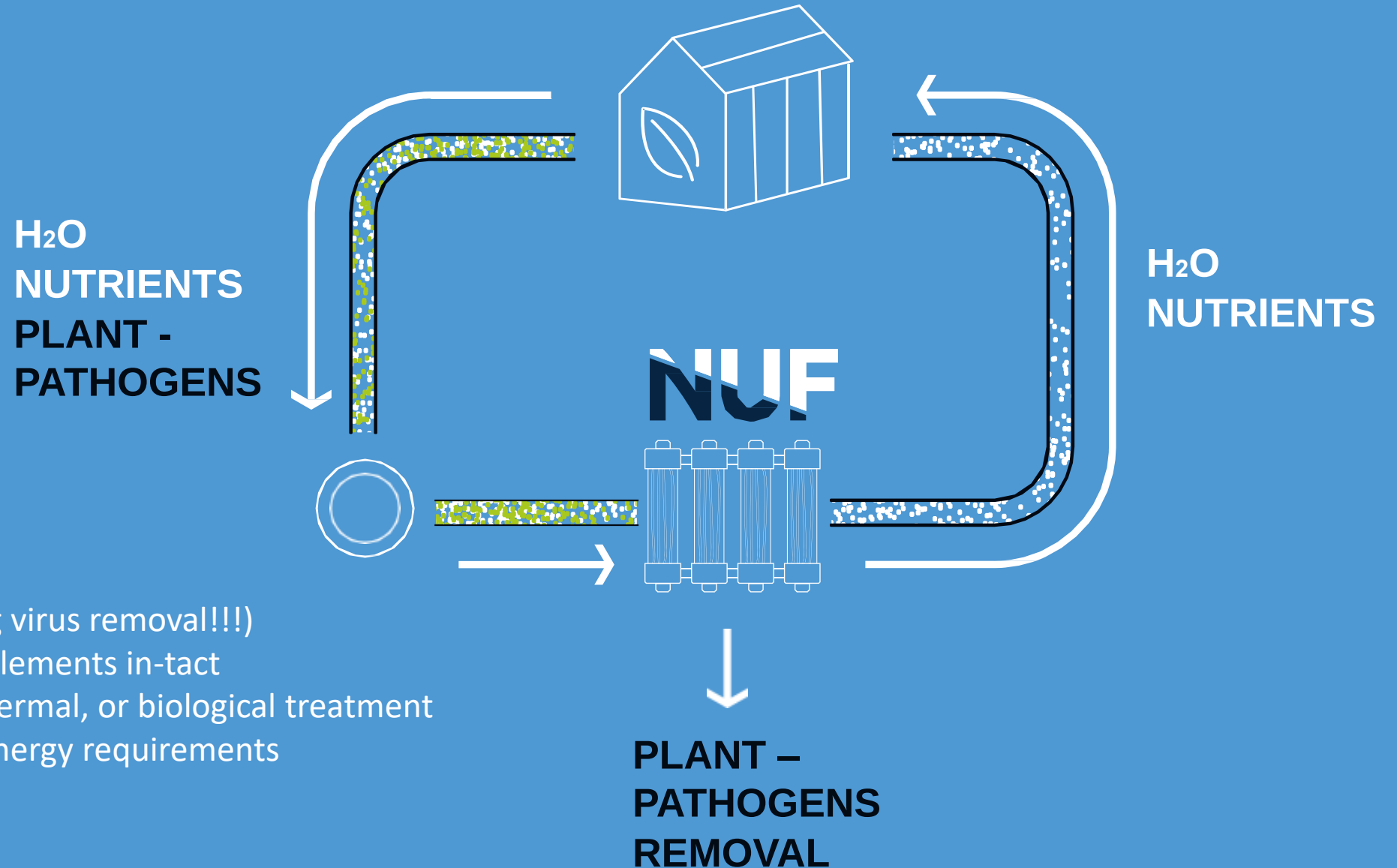


Common applications for NUF®

1. **Drainage Water recycling – Re-use of Water and Fertilizers in closed water systems for maximizing cost-savings and minimizing environment-impact;**
2. **Fire –wall for the water source – assuring water that are free from viruses and virus-like organisms, fungi, fungus-like organisms, fusarium, bacteria, nematodes, protozoa, algae;**
3. **Rain water harvesting – maximizing use of immediate natural resource while assuring water are free from pathogens (above mentioned)**



Re-use of irrigation water with NUF[®]



- ✓ Re-use 98% of water
- ✓ Remove pathogens (5-6 log virus removal!!!)
- ✓ Keep fertilizers and micro elements in-tact
- ✓ Without using chemical, thermal, or biological treatment
- ✓ Minimal, almost no-cost, energy requirements

Typical setup of NUF® for irrigation water re-use





CASE STUDIES

*Lab results
from selected
customers*

Parameter		Results	Results
		Raw water	After NUF
Turbidity	(NTU)	25.2	0.6
Color	(Hazen)	17	4
pH		6.8	7.0
T-Hardness	(ppm as CaCO ₃)	96	88
Sulfate	(ppm as SO ₄)	8.32	8.58
Nitrat Nitrogen	(mg/l)	0.71	0.72
Chloride	(mg/l)	11.9	11.4
Fluoride	(mg/l)	<0.02	<0.02
TSS	(mg/l)	58	<1
TDS	(mg/l)	114	112



CASE STUDIES



Greenhouse water re-use

For over 20 years SHEFER NURSERY is re-using water in their 10 Ha nursery, first using UV treatment for a decade, then switching to Thermal treatment in order to reduce running & operational costs.

SHEFER NURSERY is using NUF™ membranes since early 2016, cutting the running-costs by more than 80%, without compromising on results.

There are currently 4 NUF systems installed for drainage water recycling and rainwater harvesting.



Qatar - Nabati

Nabati, delivering the freshest vegetables daily to premium hypermarkets.

Developing the future of farming, using the most cutting edge thinking from around the world combined with a professional team and technology. Nabati offers potential farmers an easy solution or fully customized farming systems.

30 m³/h NUF unit already installed



South Korea – Nongsan

Nongsan, the leading producer and exporter of Korean paprika



<http://paprika.kr/>

6 NUF units already installed



NUF[®] systems



USA



Turkey

Netherlands - Fromboer

6 Ha of exciting varieties of lettuce that grow all year round

“The lettuce grows in a system where the water is continuously filtered and reused. This creates a closed system of watering and there are no discharges into nature. Because the climate in this system is much drier than in soil cultivation, people suffer much less from diseases. There is also no need to control weeds and disinfect the soil. As a result, a clean and reliable product is delivered.”

<https://www.fromboer.com/cultivation-system/>



2 NUF units already installed



POOLS

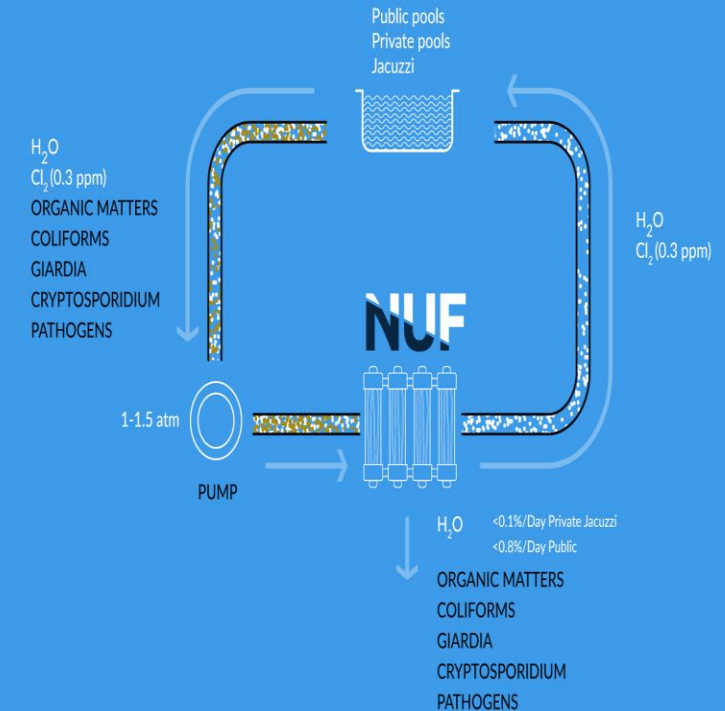


POOLS WATER



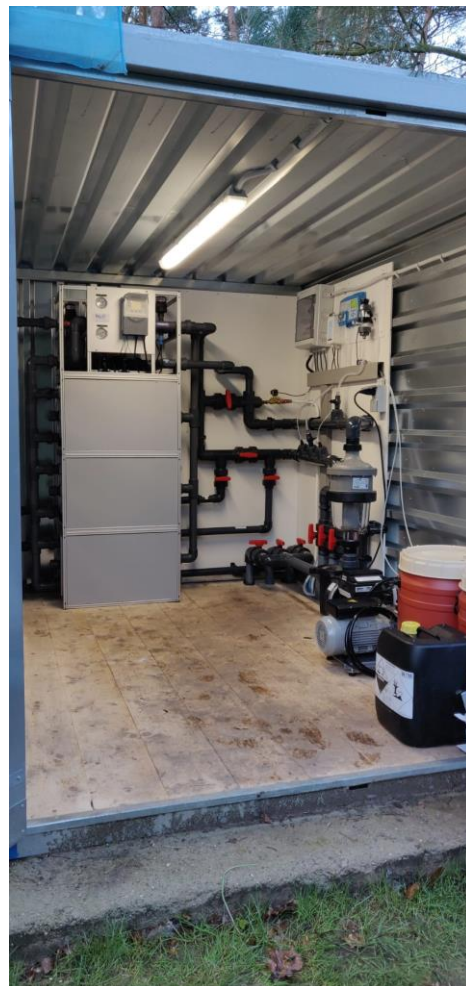
PURIFICATION SCHEME IN POOLS

- ✓ FILTRATION STAGE: IN TO OUT
 - ✓ BACKWASH STAGE (UP TO 2 TIMES A DAY): FROM OUT TO IN
 - ✓ CEB (CHEMICAL ENHANCED BACKWASH) – UP TO ONCE A DAY
 - ✓ DISCARDED WATER VOLUME (BW AND CEB): FROM 0.1% TO 0.8% OF THE BASIN VOLUME PER DAY
-
- ✓ APPROVED TECHNOLOGY – ISRAELI MINISTRY OF HEALTH
 - ✓ LIMITED FOOTPRINT
 - ✓ **AFFORDABLE !!!**





NUFilter systems in pools

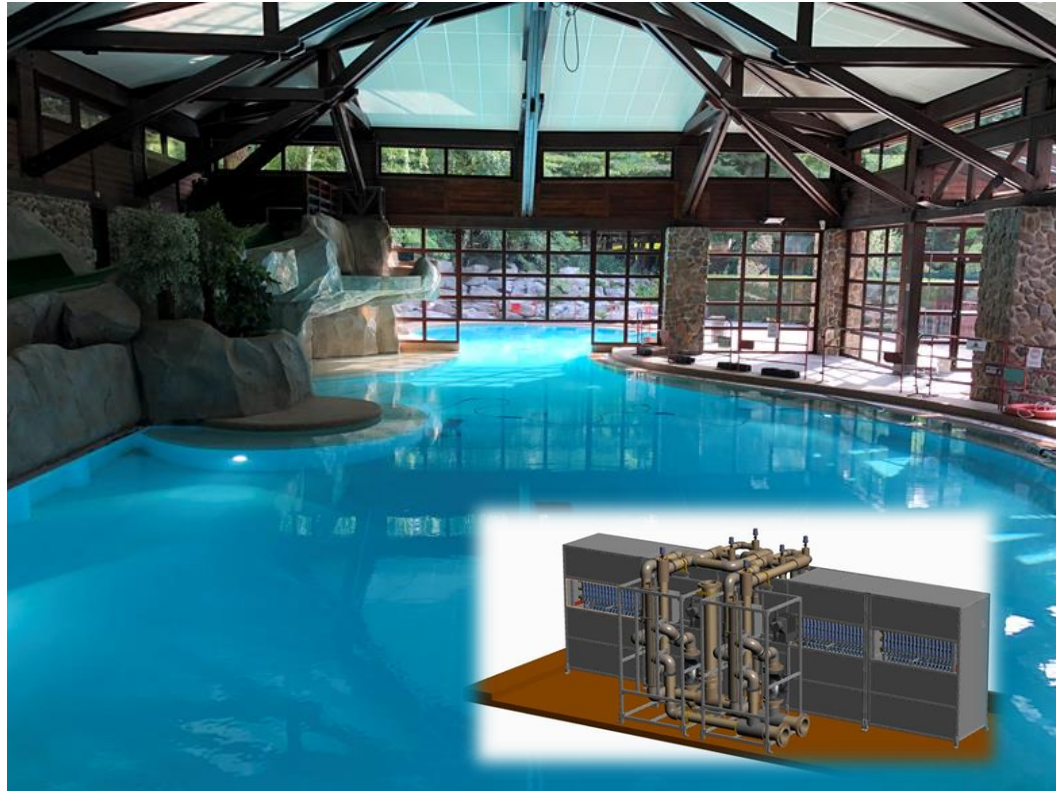




CASE STUDY - Euro Disney



Indoor Public pool 400 m³



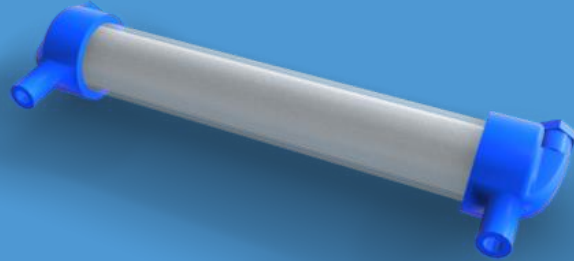
Indoor Jacuzzi 16 m³





NUF[®] and social responsibility

Reusing 1 NUF[®] membrane is equal to



immediate saving of 1.2 Kg of CO₂ emission

To USE or to RE-USE, that is the question !

Winner of 2019 Famae Challenge

FAMAE is an independent family foundation that supports innovation in the field of environment. The foundation organizes every year an International Challenge to help inventors to create simple and innovative solutions that can substantially improve our daily lives, while significantly alleviating environmental footprints.



Mino Negrin – founder & owner of NUFiltration



<https://famae.earth/en/home>

NUFiltration is a company with a mission

- NUFiltration (New Ultra Filtration) is a water-technology company with a **Circular-Economy vision**.
- The core of NUF[®] systems are NUF[®] membranes, collected from Dialysiss Centers
- NUF[®]'s **self MCM patented backwash technique** extends the lifetime of NUF[®] membranes in terms of years.
- NUF[®] systems are **engineered in Israel and manufactured in Italy** by NUFiltration.
- Compared to existing UF systems, NUF[®] systems are superior in terms of performance, CAPEX and OPEX



NUE

