



INNOVATIVE HYBRID MBR SYSTEMS TO PROMOTE WATER REUSE

www.life-aware.eu

DURATION:

1st January 2013 - 30th June 2016

BUDGET:

2.631.249 €



LIFE11 ENV/ES/000606

MBR PROTOTYPE:

MBR-UF: Removal of COD + SS-Turbidity+ N&P+ Disinfection

PAC-NF PROTOTYPE:

Removal of priority pollutants-pharmaceuticals and conductivity

BIOLOGICAL TREATMENT



Biological tanks:

- Capacity: 2 – 3 m³/h
- Working volume: 20 m³
- Configuration: COD with N&P removal

2 X CAPILLARY (0.8 MM I.D.) NF MEMBRANES MODULES



- Nominal capacity: 1 m³/h per module
- Area: 40 m² per module
- Configuration: sidestream inside-out filtration
- Operation: internal recirculation crossflow
- Material: PES
- Pore size : 1000 Da

2X MULTITUBULAR (5.2 MM I.D.) UF MEMBRANES (+ 1 RESERVE)



- Nominal capacity: 1.5 m³ per module
- Area: 33 m² per module
- Configuration: sidestream inside-out filtration
- Operation: airlift
- Material: PVDF
- Pore size : 30 nm

ADVANCED OXIDATION PROTOTYPE: Disinfection and removal priority pollutants-pharmaceuticals



Combination of O₃, UV and H₂O₂

Ozone generator:

- Treatment capacity: 1 m³/h
- Production capacity: 10-40 g/h
- Ozone concentration: 40-120 g/Nm³

UV reactor:

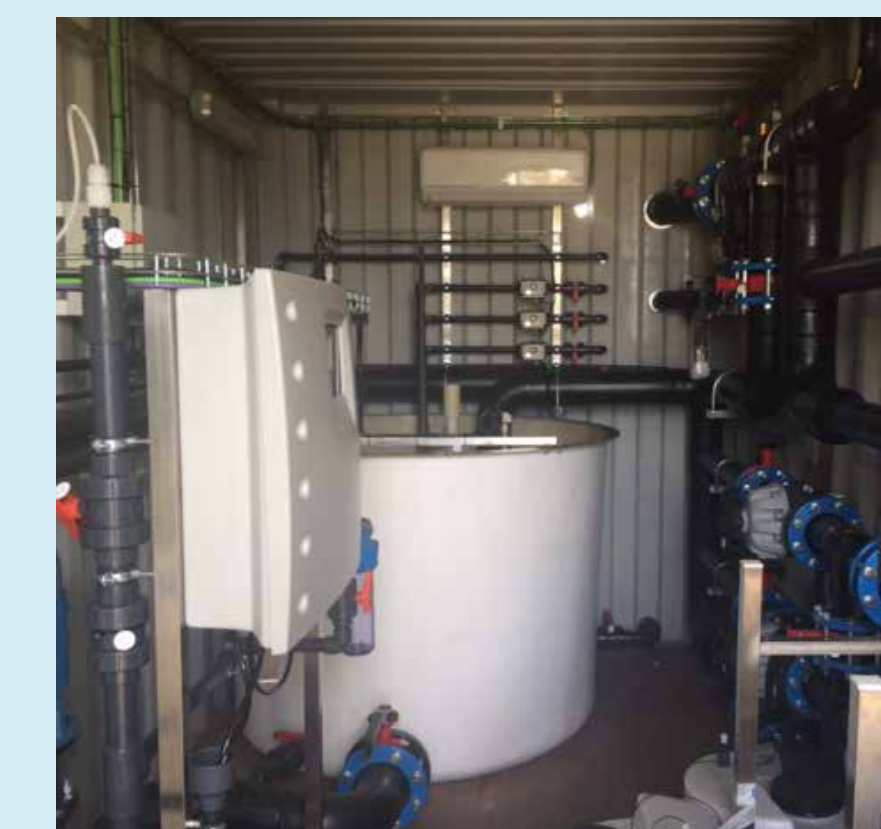
- Treatment capacity: 0.8-1.7 m³/h
- Lamp power: 25 W

1 X MULTITUBULAR (3.5 MM I.D.) NF MEMBRANE



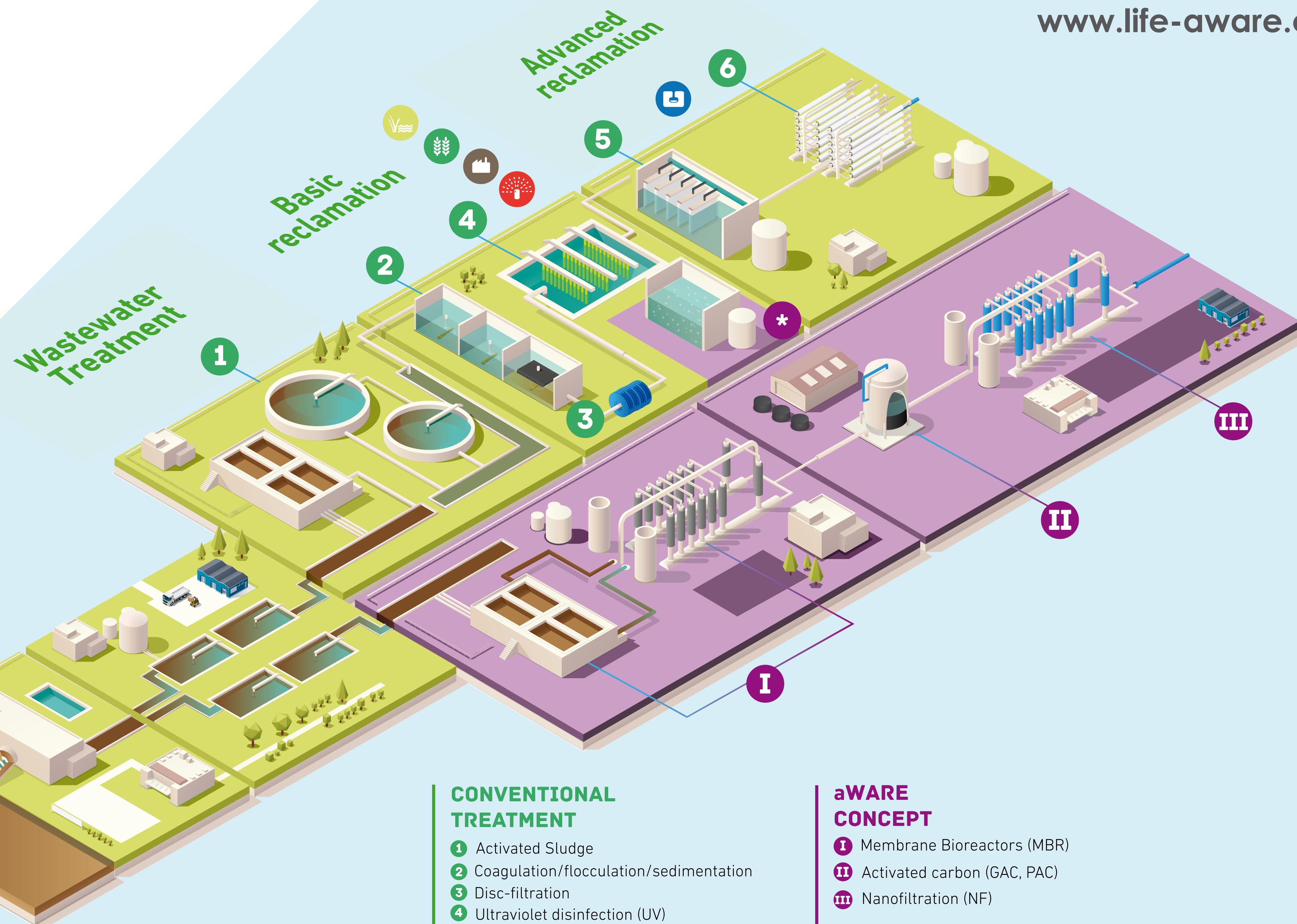
- Nominal capacity: 50 L/h
- Area: 1.6 m²
- Configuration: sidestream inside-out filtration
- Operation: internal recirculation crossflow
- Material: ceramic TiO₂ / Al₂O₃ / ZrO₂
- Pore size: 1000 Da

WATER DISTRIBUTION NETWORK PROTOTYPE: Operational strategies in water distribution networks



3 x parallel/series removable pipes

- Pipes material : PET
- Pipes diameter: 100 mm
- Nominal capacity: 50 m³/h total
- Maximum pressure: 6 bar



CONVENTIONAL TREATMENT

- 1 Activated Sludge
- 2 Coagulation/flocculation/sedimentation
- 3 Disc-filtration
- 4 Ultraviolet disinfection (UV)
- 5 Ultrafiltration (UF)
- 6 Reverse osmosis (RO)

aWARE CONCEPT

- I Membrane Bioreactors (MBR)
 - II Activated carbon (GAC, PAC)
 - III Nanofiltration (NF)
- * Advanced Oxidation Processes (UV/O₃/H₂O₂)

AWARE DEMONSTRATION SITE:

The **water reclamation plant of El Baix Llobregat** upgrades secondary effluent sourced from the Wastewater Treatment Plant (WWTP) in a basic and advanced treatment scheme designed to achieve required quality for different uses within the **Barcelona's Metropolitan Area Water Reuse Scheme**.



Ecological purposes (Basic Reclamation)

- Maintenance of ecological Llobregat River flow
- Recharge of the river basin aquifers
- Maintenance of natural wetlands of Llobregat River delta



Municipal and industrial users (Basic Reclamation)

- Green areas irrigation and industries in the Montjuïc area
- Street cleaning



Agricultural irrigation (Basic Reclamation)

After treatment with satellite **Reverse Electrodialysis (EDR)** system



Direct aquifer recharge (Advanced Reclamation)

Hydraulic barrier against saline intrusion

OBJECTIVES:

- To demonstrate that an innovative hybrid MBR-PAC-NF treatment scheme can be an efficient alternative compared to the most commonly implemented water reclamation technologies.
- To optimize operational parameters and fouling control strategies of an advanced reclamation scheme based on ultrafiltration (UF) – reverse osmosis (RO) technologies.
- To evaluate the influence of advanced oxidation processes on tertiary treated effluent water quality and on fouling of UF and RO membranes.
- To compare conventional and advanced treatment schemes in terms of removal efficiency of priority-emerging pollutants and from a sustainability point of view (Life cycle Assessment and Cost Benefit Analysis).
- To evaluate the influence of a distribution network of reclaimed water on the water quality and to develop management and control strategies that ensure point of use standards.
- To contribute to the achievements of EU challenges in the water sector and to widespread the projects know-how to stakeholders related to the water sector.

CONSORTIUM:



STAKEHOLDERS:

