

# Recovery and utilisation of nutrients for low impact fertiliser



## Technology factsheet – Anaerobic Membrane Bioreactor

### Recovery of biogas and liquid nutrient rich effluent from domestic wastewater

The MEMB-RANER (Membrane Reactor for Anaerobic Nutrient and Energy Recovery) combines anaerobic processes and membrane micro or ultra-filtration within a single step, providing separation of sludge and clean water, and achieving the decoupling of the hydraulic and solid retention times. Anaerobic processes consume less energy compared to aerobic systems, since no oxygen is needed for the removal of organic matter. Moreover, anaerobic processes transform biodegradable organics into a biogas stream, mostly composed of methane and carbon dioxide. Bioenergy, as heat and electricity, can be harvested from the biogas, while most of the nutrients are conserved and liberated in the liquid effluent (permeate) as ammonium and phosphate. Microbiology quality of the permeate is excellent, with undetectable presence of suspended solids, which makes it suitable for reusing the water and nutrients embedded in the effluent in agriculture (fertigation). The combination of MEMB-RANER and fertigation reduces CO<sub>2</sub> emissions due to the organic matter valorization and the partial avoidance of mineral fertilizer requirements. Additionally, the anaerobic process is acknowledged for its low excess sludge production. In Run4Life, a MEMB-RANER submerged configuration with ultrafiltration flat sheet membranes (6.25 m<sup>2</sup> of membrane with 35 nm nominal pore) is applied to treat blackwater from office buildings collected using conventional toilets. Biogas with >75% in concentration of methane is produced when treating 0.8-1.4 m<sup>3</sup>/d of blackwater at room temperature (18-28°C), removing more than 90% of the organic matter. An additional MEMB-RANER (28 m<sup>2</sup> of membrane) will treat the domestic blackwater generated in a business park in Vigo.

### Key facts

- Small footprint with low sludge production
- Operation at high biomass concentration
- Liberate nutrients (ammonia and phosphorus) to soluble form for subsequent recovery or direct application (fertigation)
- High quality permeate: suspended solids, virus and bacteria free

### Application in Run4Life demosites

- Input: black water
- Output: biogas, concentrate (excess sludge), permeate (liquid effluent)
- Applied in Vigo



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<https://run4life-project.eu>