LIFE MEMORY Project finalizes the construction of the Anaerobic Membrane Bioreactor demo plant for urban wastewater treatment.

Action Groups are at the core of EIP Water and form the central element of the partnership's implementation phase. The Action Group entitled "Anaerobic Membrane Bioreactor for Recovery of Energy and Resources to achieve Sustainable Water Reuse (ID AG036)", was the germ of the LIFE MEMORY project (Membranes for Energy and Water Recovery). The main aim of this project is the development of an anaerobic membrane reactor, which involves work on assessing an alternative wastewater treatment based on AnMBR technology more sustainable.

Thus, the LIFE MEMORY project proposes to demonstrate at an industrial scale the Anaerobic Membrane Bioreactor (AnMBR) technology, as an alternative to traditional urban wastewater treatment. This new approach focuses on a more sustainable concept, where wastewater turns into a source of energy and nutrients, and also a recyclable water resource.

Figure 1: Logo LIFE MEMORY Project

In the project consortium FCC Aqualia (coordinator), the University of Valencia, the Polytechnic University of Valencia and Koch Membrane Systems are involved. All of them are founding members of this Action Group.

The LIFE MEMORY Project has the following main objectives:

- Reducing WWTP (Waste Water Treatment Plants) energy consumption per m^3 of treated water by 70%.
- Reducing by 80% of the greenhouse gases emission per unit of COD removed from the influent wastewater, avoiding the oxidation of organic matter.
- Reducing up to 25% of space requirements.
- Increase effluent quality for reuse and minimization of sludge by 50%.

The final location for the demo plant is Alcázar de San Juan WWTP (Ciudad Real, Spain).

Figure 2: Alcázar de San Juan WWT and location in Spain.

After selecting the location, the main sets of equipment composing the prototype were designed and procured. The demo plant consists in an anaerobic reactor (42 m^3 of total volume) connected to three membrane tanks (0.8 m^3 of total volume each). The tanks include a commercial membrane module of ultrafiltration (PURON® Koch Membrane Systems (PSH 41), 0,03 µm pores) with a total membrane surface of 42 m^2 each. Design parameters were: maximum total solids concentration in membrane tanks of 15.000 mg/L; maximum sludge recirculation flow 3Q and minimum water temperature of 10ºC.

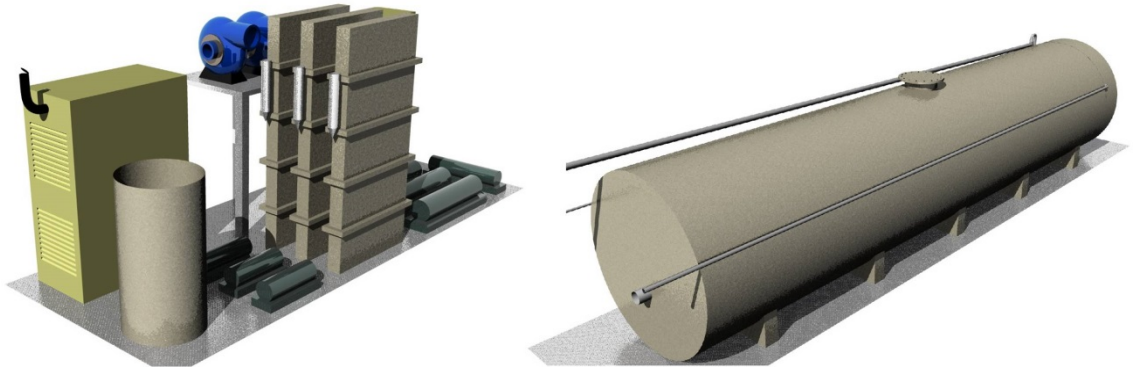

Figure 3: 3D AnMBR design

This design allows treating 31 m^3/d with a water temperature of 10ºC and SRT of 80 days. If temperature raises until 25ºC the demo plant could treat up to 78 m^3/d with a SRT of 32 days.

After completing the design of the different components of the demo plant, it was constructed and eventually it is installed in the selected facility.

Figure 4: AnMBR demo plant constructed and installed

Hydraulic proofs and other specific tests has being conducted in order to monitor carefully that each sub-system is operating according to plan.

Expected results of the LIFE MEMORY project are:

- Reduction of energy consumption per m^3 of treated wastewater by 70%: compared to typical consumption ratios in WWTPs based on CAS process (0.25-0.6 kWh/m^3) and aerobic MBR systems (0.50-2.5 kWh/m^3), the proposed technology offers a sharp reduction in electricity consumption and the related carbon footprint.
- Reduction of CO_2 emissions from the oxidation of organic matter by 80%, passing from (in CO_2 equivalents) 2.4 kg CO_2/kg COD eliminated to 1.4 kg CO_2/kg COD eliminated; thus greatly decreasing the carbon footprint of the wastewater treatment plant.

- 25% less of space requirements of the facility, compared with CAS plants based on aerobic processes.
- Sludge production significantly reduced (down to 50% kg TSS/kg COD removed).
- Implementation of a protocol for the design and operation of WWTPs based on the innovative AnMBR technology.

From an environmental, economic and social point of view, AnMBR for wastewater treatment is a promising technology compared with other existing wastewater treatment technologies for medium to high-strength wastewaters. Although various demo projects are under way with promising results, some issues must be further studied (recovering efficiently the methane dissolved in the effluent, treating low-loaded wastewaters at low temperatures, identify value of nutrient rich irrigation reuse, optimise micropollutants removal,…). Financing and development of new research is required to progress in the urban wastewater treatment by AnMBR technology and to help to fully realize its potential for sustainable resource recovery and energy production.