

# ECOMBR

**Development of novel hybrid treatment systems using membranes, for urban and industrial wastewater, providing reduced operating costs and process improvement of existing working methods**



The object of the project is the development of reliable systems for processing domestic and industrial wastewater using membranes, with reduced energy and chemical consumption, incorporating innovative methods/systems for cleaning membrane elements.

The value of the proposal lies in the possibility of immediate utilization and the simplicity of the concepts and practices that can be applied both to existing arrangements, adding additional value, and to constitute the basic idea for the development of new and innovative products, required by the constantly developing global “market” of membrane bioreactors (MBR) where they replace existing wastewater treatment systems at a fast pace because of the significant advantages they possess, mainly high efficiency and energy savings.

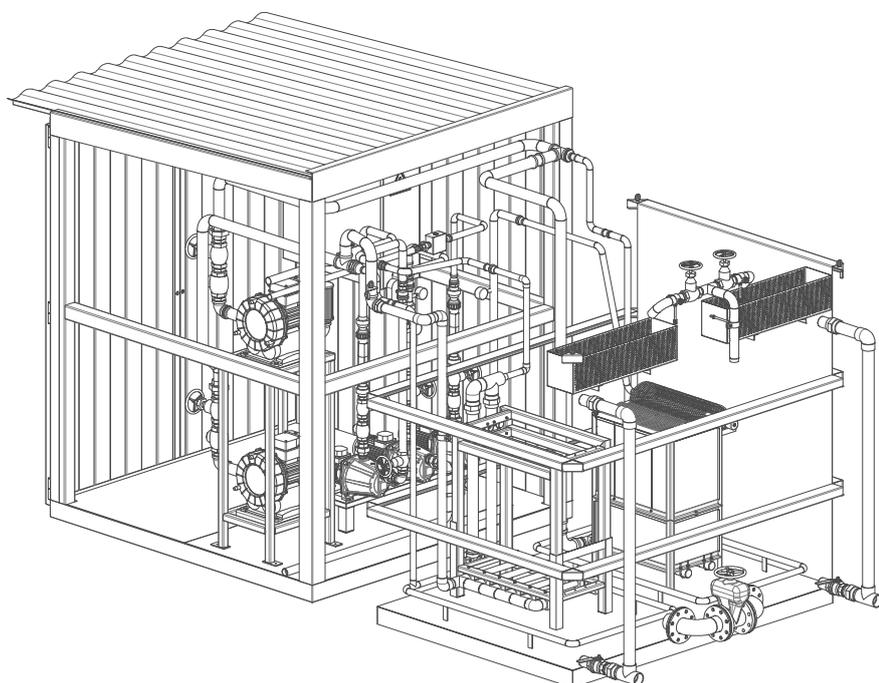


**European Union**  
European Social Fund

**ΕΡΑνεΚ 2014-2020**  
OPERATIONAL PROGRAMME  
**COMPETITIVENESS  
ENTREPRENEURSHIP  
INNOVATION**

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The first approach introduces a new method of applying high-frequency dynamic pressure (HFPV) on membrane elements using vibrators, while the second approach highlights the benefits of applying back washing (BW) with varying water temperature (HTBW). Experiments with high-frequency pressure and increased water temperature BW on various test setups have shown significant improvement in the functional characteristics of the process (flux and pressure) for all test cycles without any effect on the physical-chemical or microbiological characteristics of the effluent, while also applying extremely reduced air cleaning supply of the membranes during the experiments and reducing cleaning energy consumption by up to 90%.

The first method concerns the cleaning of membranes using high-frequency vibration. This method was applied for the two main commercial types of membranes (hollow fiber/flat sheet) from different manufacturers using different vibrators, different vibration shapes, under different operating conditions. In all cases, the results were remarkable, as the method appears to work constructively on the fouling material on the surface or near it, and internally, resulting in an acceleration of the separation, detachment and fragmentation of the structure of the pollution without damaging the membrane material. Specifically, a reduction of transmembrane pressure (TMP) in the range of 14-73% and an increase in membrane flux of 10.6-87.3% were measured depending on the applied vibration shape, type and operating condition of the examined membrane. It should be noted that the above results were compared with conventional methods and found to be superior in terms of performance and efficiency.

The second method concerns the effect of the water temperature of back washing procedure on the functional behavior of the membranes. It has been tested with increasing water temperature and variable duration of washing. A significant improvement in the system's performance characteristics was observed according to the increase of the temperature of the water used and the duration of the application. The results were fluctuated from 11.7-27.95% in terms of TMP reduction and 11.8-24.41% in terms of Flux increase. Compared to those recorded using backwashing water at ambient temperature, they had a clearly better performance.

The improvement percentages increase particularly when HFPV and HTBW are applied together, opening new prospects for fouling control and energy savings in membrane systems.

For more updated information of ECO-MBR please visit [www.ecotech.gr](http://www.ecotech.gr)



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