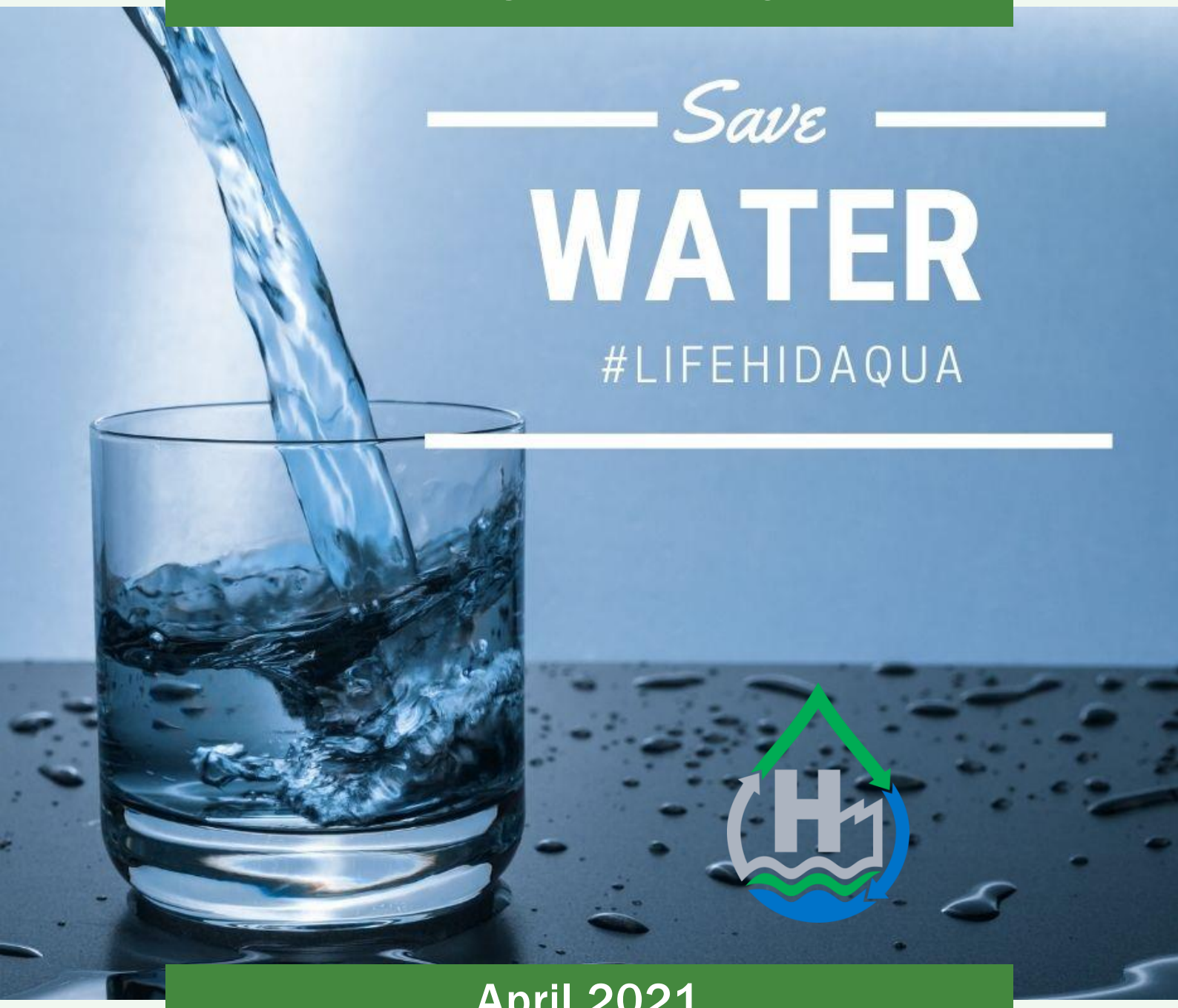
NEWSLETTER N°3



April 2021

The Life Hidaqua project has received funding from the European Union under grant agreement n° LIFE 18 ENV/SI/000673.

Preparatory Actions have been finished

Three types of water (industrial wastewater, brackish water and storm water) were analysed eight times (Figure 1). The following parameters were measured:

- The quantity of elements such as Na, Mg, Ca, B, Al, Si, Cr, Mn, Fe, Ni, Cu, Zn, As, Se, Cd, Sb, Hg and Pb, the concentrations of anions such as ammonia, nitrate, sulphate, sulphite, phosphate, fluoride, chloride.
- The monitoring also included analysis of total inorganic carbon (TIC), total organic carbon (TOC) and chemical oxygen demand (COD), redox potential, turbidity, electrical conductivity, total dissolved solids (TDS) and total suspended solids (TSS).
- Among organic contaminants, 16 polycyclic aromatic hydrocarbons (PAHs) and Mineral Oils index and Fats were measured as well in all three types of water samples.

Figure 1: Sampling of industrial wastewater, brackish water and storm water was taken at Hidria's location in Koper, Slovenija.

Pumping experiment

To get basic information about aquifer and test the installed equipment (Figure 2) a prepumping test was performed. Submersible pump was set on different water flow and monitored on site. By exporting the data, we obtained some important information, which will serve as the basis for the development of a geochemical and hydrogeological model of the well.

Figure 2: Brackish water is continiously monitored for electroconductivity, temperature and flow.

Optimization of initial parameters and processes

General information about the proposed treatment technologies:

Ultrafiltration (UF) and reverse osmosis (RO) are powerful and effective water filtration systems available on the market. Ultrafiltration is a filter system, while reverse osmosis is an excellent technology that eliminates the majority of dissolved from the water.

Results of laboratory optimization

The bench-scale ultrafiltration tests were carried out with a tubular ceramic membrane for treatment of pre-treated industrial and brackish water. Ceramic membranes are usually the best choice for treating wastewater with high oil and grease content due to their mechanical strength and high resistance to degradation caused by aggressive chemical cleaning procedures.

The UF was able to reduce oil content, COD, turbidity and metals in the permeate. Contrary to our expectation, the removal rates of COD and O&G were not very high, 24% and 43% respectively. On the other hand, high elimination of turbidity and iron was achieved (92 and 94% respectively). The high turbidity removal (< 1 NTU) can be clearly seen in Figure 3 where a comparison of initial, permeate and concentrate samples are shown.

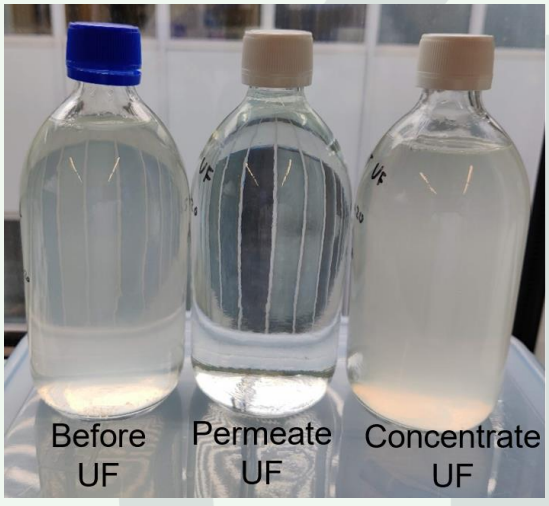


Figure 3: Comparison of treated water with UF.

After UF treatment, bench scale reverse osmosis tests with regenerated membranes were carried out to assess the performance of RO in eliminating the conductivity and COD values. The testing set-up for the evaluation of membrane performance is shown in Figure 4.

In the reverse osmosis test with the use of regenerated membranes a high quality permeate was obtained with a recovery rate of 75%. A conductivity of 0.05 mS/cm was achieved, which is significantly less than the original goal of 0.6 mS/cm. In addition, high removing rates of O&G and COD were achieved as well, removing almost all oil and grease present in the wastewater after the UF.

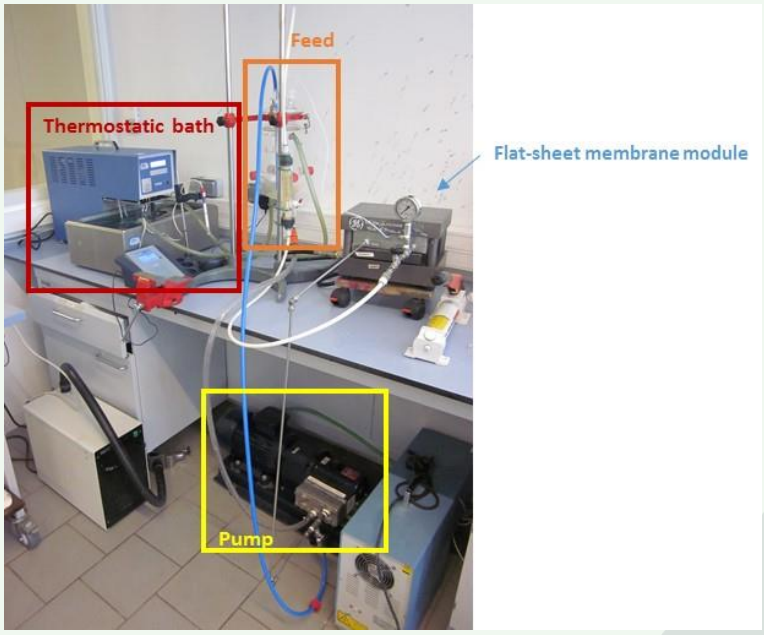


Figure 4: Experimental set-up for membrane testing at lab-scale.

Subsequently, electrodialysis tests were performed to the reverse osmosis concentrate in order to assess the ability of this technology in reducing the dilute conductivity until a value similar to the entrance of the reverse osmosis, where it will be recirculated in the prototype. The Electrodialysis reversal (EDR) set up with the 5 stacks and the global experimental system is shown in Figure 5.

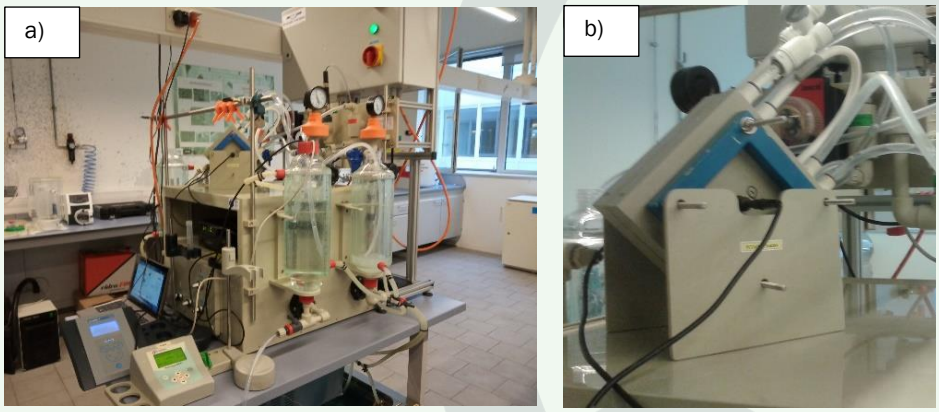


Figure 5: EDR experimental system: a) experimental set up; b) EDR cell.

With the use of EDR we successfully treated the RO concentrate and obtain a dilute stream with the same conductivity as the RO influent (around 2.2-2.8 mS/cm). At the same time, a recovery of 78% was achieved. This result will be used as a reference to estimate the remaining concentrate stream left to be treated with solar evaporation in the prototype.

NETWORKING OPPORTUNITY!

Are you interested in water remediation technologies and the use of alternative water sources in industry?
Are you a potential technology user or other stakeholder?
Are you a partner / coordinator of LIFE or a similar project?

We kindly invite you to contact us and let's network!!

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