

## ECUVal: a story of effort and perseverance

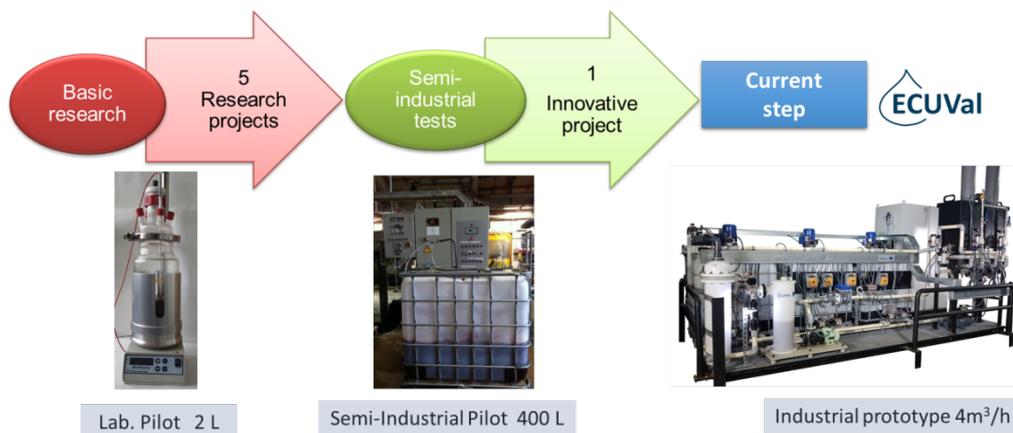
The textile dyeing and finishing industry is one of the main water consumer industries and generates high volume of wastewater generally with a high coloration and salinity. One of its main problems arises when reactive dyes are used because they have high chemical stability and resistance to the microorganisms attack. Consequently, the residual dyes cannot be removed in the conventional biological plants and the use of other specific treatments is required. The most usual colour removal treatments are based on the separation of dyes from the effluent. But they generate a waste containing the concentrated pollutants and a further treatment is required.

This problem together with the growing shortage of water led the UPC research group of Environmental Engineering (ENMA), coordinated by Carmen Gutiérrez, to look for alternative solutions that would result in a more sustainable textile industry.

In this way, in 2001, the ENMA group started the first research project to study the removal of dyes in textile wastewater by means of electrochemical techniques (**EC**), financed by the Spanish Ministry of Science and Technology. Traditionally, the electrochemistry was applied for the recovery of metals and for the synthesis of chemical compounds. Its use for the degradation of pollutants was still not developed.

This first project was followed by 4 other research projects, which enabled to expand the knowledge on the electrochemical degradation of dyes. These successive projects were based on the combination of electrochemical techniques (EC) with ultraviolet (UV) irradiation. It was shown that the combined **ECUV** treatment enhanced the process efficiency. The recycling of the treated effluents was also evaluated in order to achieve lower water consumption and reduction in the discharge of salts.

All this research at laboratory scale resulted in two patents whose industrial viability was studied through one Regional project on innovation and technology transfer. At that moment, the total funding obtained for the research was 632,881 €. The promising results obtained both in the semi-industrial scale validation and in the market studies, encouraged the ENMA group to cover a new stage: the **ECUV valorisation** which gave rise to the European project “**ECUVal**” also coordinated by Carmen Gutiérrez and assisted by Valentina Buscio, researcher at full time in the development of the project.



ECUVal is a 3-years project started in January 2015 with a total budget of 1,476,511€. It is co-funded by the Eco-Innovation Initiative of the European Commission, through the European Agency for the Medium and Small Enterprises (EASME). Four members constitute the ECUVal consortium: one university (UPC: ENMA and TEXTEC research groups), two SME (ICOMATEX: textile machinery manufacturer, and GRAUSA: textile dyeing mill) and one technological centre (FITEX). The ECUVal project aims to make the industry more sustainable by introducing into the market an eco-friendly technology that combines an electrochemical technique with UV irradiation to clarify the effluents and save water and salts. The purified effluent can be either discharged or stored for reuse. The main advantages of the ECUVal system are:

- 100% colour removal
- Reuse of up to 100% treated effluent
- Reuse up to 100% salt
- Reduction of effluent salinity and wastewater discharge rates.

The ECUVal system also decreases 30% the environmental impact with respect to the current wastewater treatments, which results in 21% reduction of the carbon footprint.

The textile industry has led the way in applying the first ECUVal industrial prototype able to treat 4m<sup>3</sup>/h, in response to the large quantities of wastewater produced in the dyeing process. The invention has been patented and licensed to Icomatex for its exploitation in the textile market. However, the ECUVal system is also appropriated for a wide range of industries that produce wastewater with poorly biodegradable organic compounds and high salinity. The project ELDE, which will be developed during the next years, will explore the possibilities for the expansion of the ECUVal technology to 3 industrial sectors. ELDE consortium includes 7 partners and will be also coordinated by the research group ENMA.

The main strength of ENMA is its wide know-how in all technologies related to industrial wastewater treatment and recycling of the treated effluents. Founded in 1975, it is one of the pioneers in affording the treatment of wastewater in Spain. In the last years its research is mainly focussed on the recycling of treated effluents. However, the small size of the group ENMA is maybe its main weakness. The inclusion of young research fellows to enlarge the group and the transmission of the know how of the senior researchers is at this moment one of the ENMA's priorities.

Currently the coordinator of ENMA is a woman and the number of women in the group significantly overcomes the number of men (7 women and 4 men). The new members of the group are always selected for their personal value and for what they contribute to the group. The genre is not taken into account for the selection of new researchers. Moreover, ENMA also contributes to the diffusion of the gender equality criteria in the society. Thus, the junior promoter of the group, Beatriz Amante, participates in a program that aims both to promote the studies of engineering among young women in secondary education and also to achieve a better professional development in the academic or professional ambit of young women that are studying Engineering at UPC.

Beside all these considerations, it is important to highlight that the effort and the perseverance are the main key elements to achieve the objectives of the research group ENMA (Environmental Engineering – UPC).