

# THE EXPERIMENTAL PLANT OF CARRIÓN DE LOS CÉSPEDES (SEVILLE): 20 YEARS OF RESEARCH AND TRANSFER OF KNOWLEDGE IN WASTEWATER TREATMENT

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## Abstract

Since its inauguration, the Experimental Plant of Carrión de los Céspedes (PECC-Seville) has focused its activity to the research and development of wastewater treatment technologies, especially those applicable to small populations. This population range presents, nowadays, important lacks in the field of sanitation and wastewater treatment. Concretely, it has been estimated than around 3-4 million of person equivalent (p-e) have not their wastewater properly treated. Since its beginnings, with a initial surface of 21,000 m<sup>2</sup> addressed to non-conventional or extensive technologies (Lagooning, Green Filters, Peat Filters, Constructed Wetlands), to the current moment, with an extension of 41,000 m<sup>2</sup> where both extensive and intensive technologies (Trickling Filters, BRC, MBR, SBR, extended aeration, etc.) cohabit, the PECC has evolved from the basic experimentation to the excellent research. Along these two decades, the PECC has played a major role as a knowledge transmission and diffusion path. At the present time, the PECC, which is managed by the Foundation Center for New Water Technologies (CENTA), is considered a singular research platform as it holds a wide variety of treatment technologies that are operated under the same conditions (influent's quality, meteorological pattern, technical assistance and analytical monitoring). It has also become a meeting place for the three bodies involved in the wastewater treatment and management: the administration, the research community and the private entities. The PECC enjoys an international recognition and its philosophy has been exported to other countries, such as Morocco and Uruguay.

**Keywords:** experimental plant, wastewater treatment, small populations, technologies' validation, testing facilities.

## Introduction

In 1987 the Andalusian Government launched the R & D Plan for Non-Conventional Technologies, focusing on the search of specific solutions for the treatment of wastewater generated in small populations. Among the actions undertaken under this plan, it is remarkably the construction of an Experimental Wastewater Treatment Plant located in Carrión de los Céspedes (Seville).

## Evolution

In its beginnings, the Experimental Plant of Carrión de los Céspedes (PECC) only held non-conventional technologies, nowadays properly called extensive (Green Filter-land application-, Lagooning, Peat Filters and Constructed Wetlands), spread in an extension of 21,000 m<sup>2</sup> (figure 1). The PECC addressed its work on the diffusion of the non-conventional systems (mainly by guide visits to the facilities) and the identification of the design criteria for the extensive technologies in order to guarantee their adaptation to the peculiar conditions of the Andalusian territory.



Figure 1. Overview of the Experimental Plant of Carrión de los Céspedes in its origins.

In 1995, an important milestone took place: the installation of pilot intensive prototypes for wastewater treatment such as Extended Aerations, Tricking Filters, RBC, etc. This fact supposed a remarkable strengthening of both research and diffusion activities. Since 1999 the PECC is managed by the Foundation Center for New Water Technologies (CENTA).

In 2005, a first extension of the facilities (35,000 m<sup>2</sup>) was carried out reorganising the distribution of extensive and intensive systems. In addition, the monitoring laboratory was enlarged, a new and modern pretreatment was installed and, finally, the treatment capacity was increased being able to depurate the total wastewater discharge generated by the 2,300 persons equivalent (p-e) located in Carrión de los Céspedes (around 400 m<sup>3</sup>/day). Figure 2 shows an overview of the PECC in 2005.



*Figure 2. Overview of the Experimental Plant of Carrión de los Céspedes after the extension of 2005.*

Two years later (2007), a new plot of land of 6,000 m<sup>2</sup> was purchased and added to the experimental facilities, thus, increasing the research extension to 41,000 m<sup>2</sup>. This plot has been addressed to the reuse of treated water for two different purposes: the irrigation of energy crops and the recharge of aquifers.

In the last year, a new restructuring of the PECC has been executed (Figure 3). One of the works made has been the construction of an Interpretation Centre of Water's Cycle earmarked to promote diffusion and training activities. In addition, the area for the validation of prototypes have been enlarged, saving a specific plot for the CE marking of treatment systems in accordance to the CEN Standard 12.566-Part 3. CENEA, and consequently the PECC, was designated as a notify body on May 2010, being the unique national entity with this recognition.

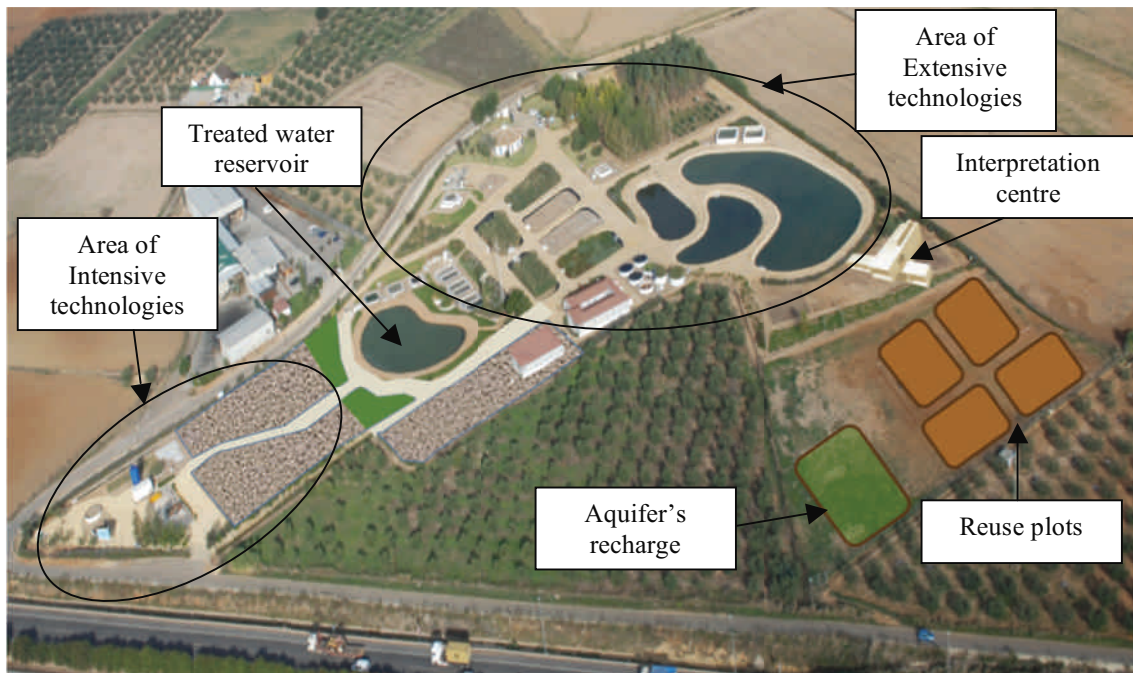


Figura 3. Current overview of the Experimental Plant of Carrión de los Céspedes.

## Conclusions

The PECC allows the real comparison of the performance of a large number of wastewater treatment technologies as all of them are fed with the same influent, operated under the same meteorological conditions, managed by the same operators and monitored by the same laboratory. This fact together with the wide range of technologies implanted, the size of the pilots systems, the flexibility of the flows' diagrams and the multiple possible combinations, makes the PECC different to any other research centre in the field of wastewater treatment.

This philosophy has been exported to other countries (such as Morocco and Uruguay), keeping the idea of implementing a wide range of pilot systems at the same facility. However, the technologies put into service in those countries have been selected taking into account the opinion of local authorities and, thus, responding to the needs and peculiar characteristics of the region.

The knowledge and experience obtained during these two last decades in the field of wastewater treatment in small populations have been compiled in two handbooks: the "*Manual of Non-conventional Technologies for wastewater treatment*" (2007) and the "*Manual for the implantation of treatment systems in small populations*" (2011), the latter one in collaboration with the CEDEX.

Finally, in 2008 the United Nations Office of the International Decade for Action “Water for Life” declared the PECC as a World Reference Centre in the field of Water Treatment, in recognition of the research and diffusion activities developed in these facilities.