

ABSTRACT

CONTROL PARAMETERS OF THE PROCESSES OF RECLAIMED WATER

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Reclaimed water is a treated effluent that undergoes an additional treatment (a process designated as water reclamation) in order to recover, partially or totally, the water quality level initially available. To promote reclaimed water as an important new water source, a water reuse system has to be planned. This water reuse system requires the definition of a set of reclaimed water quality criteria and standards, in accordance to the beneficial use of reclaimed water, the design of a water reclamation plant, and a dual distribution network to bring reclaimed water to the final point of use.

The main concern associated to the use of reclaimed water is the public health hazard that can be raised through the direct or indirect human contact with the pathogens that may be present in the reclaimed effluent. One of the main goals of a water reclamation plant is to inactivate these microorganisms, commonly through a disinfection process. The quality criteria and the user rules applicable to reclaimed water are normally expressed in terms of the microbiology properties of reclaimed water and also by water quality limits associated to different physical-chemical parameters that are related to the efficiency of the disinfection processes.

Three different reclamation plants (WRP) have been evaluated in this Master Thesis, using six physico-chemical parameters: pH, total suspended matter, turbidity, chemical oxygen demand, total organic carbon, and water transmittance. The experimental results were obtained during eight sampling seasons conducted in three different water reclamation plants (WRP) of different characteristics:

- The Mataró WRP includes a full conventional physico-chemical treatment process, followed by a disinfection step that can use hypochlorite and/or ultraviolet (UV) light. Influent water is a mixture of urban and industrial treated effluent.
- The Castell-Platja d'Aro WRP includes a sand filter and a disinfection process using UV light and hypochlorite; the plant has an optional coagulation process (mainly working during the summer). Influent water is urban residential treated effluent.
- The Empuriabrava WRP includes a biological system based on a constructed wetland (three vegetated cells) followed by a storage lagoon named Laguna Europa. Influent water is urban residential treated effluent.

The main goal of this Master thesis is to study the time changes experienced by several physico-chemical parameters, in influent and reclaimed water, during the different reclamation process, as a function of the WRP characteristics and the unit processes included in each WRP. The ultimate objective is to identify the behaviour of each parameter during the different steps of each reclamation process, and to determine those parameters most effective and reliable for achieving the water quality objectives required by the reclamation process. In addition, a comparative analysis has been conducted among those physico-chemical parameters, to identify potential empirical relationships among them that can be used to simplify monitoring and control of water reclamation processes, by identifying those parameters that provide redundant information.