

## WASTEWATER RECLAMATION BY UNCONVENTIONAL TECHNOLOGIES

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### Abstract

This work is carried out under the research project "Wastewater Reuse by using unconventional technologies." We present the first data from a study of the behavior of Intermittent Sand Filter for the regeneration of the effluent from the impoundment facility. The results corroborate that an impoundment effluent, after passing through an Intermittent Sand Filter, meet the requirements for most applications envisaged in Royal Decree 1620/2007 of 7 December, establishing the legal framework for the reuse of treated water.

### Keywords:

Intermittent Sand Filter, impoundment, reclamation, reuse, wastewater

### Introduction

Among the sustainable measures leading to an increase in available water reserves, include the use of unconventional resources, among which are the reuse and desalination. With reuse, also solves the problem of effluent discharge, given the high level of treatment achieved reclaimed water

In the field of small urban areas (less than 2,000 population equivalent), the technologies applied for the treatment of wastewater should be simple to operate and provide a low maintenance costs, which can be borne by the population they serve. Population in this area, reclamation of water must meet the same philosophy, so that technologies are applied must adapt to these same needs. Among these technologies are Intermittent Sand Filters.

In this work is to study the combination impoundment + Intermittent Sand Filter (Gunes et al., 2009) in order to determine whether they reach the final effluent of sufficient quality

(Hamoda et al., 2004), for use on any applications that includes the Royal Decree 1620/2007.

## Methods

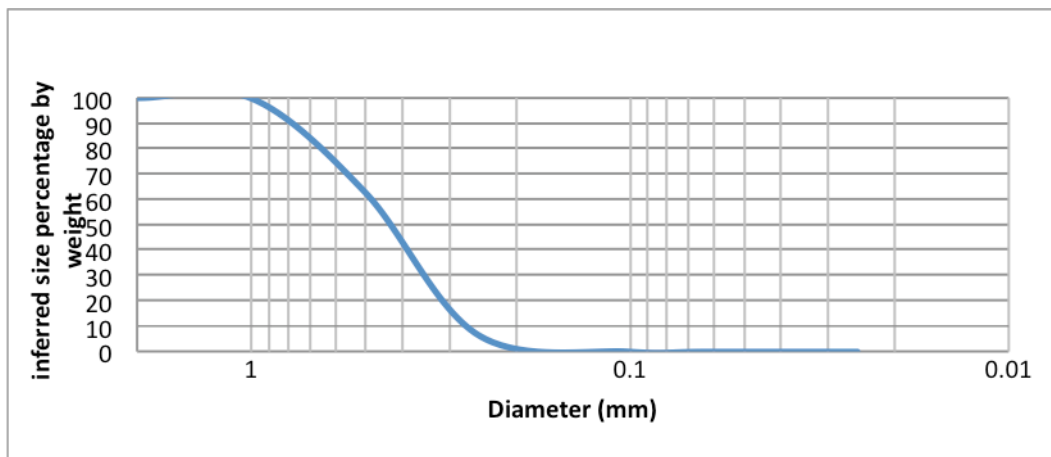
To carry out the investigations was built Arema Intermittent Filter, which is circular, open, 5 m in diameter and 1.1 m effective height.

*Figure 1. Intermittent sand filter*



As filter material washed sand was used, the particle size shown in Figure 2.

*Figure 2. Granulometry graph*



The filter is fed intermittently (Crites et al., 2000), using a pump equipped with timer, with the effluent from the impoundment facility. The average characteristics of these effluents are shown in Table 1.

*Table 1. Average characteristics of the influent and effluent of the impoundment.*

	TSS (mg/l)	Turbidity (NTU)	<i>E.Coli</i> (UFC/100 ml)	Helminths eggs (n°/20 l)	BOD <sub>5</sub> (mg/l)	COD (mg/l)
Infuent	278	217	5600000	0	303	524
Effluent	92	49	610	0	56	209
Performance (%)	61,6	77,0	99,96	-	83,2	61,7
Deviation (%)	29,1	43,2	0,11	-	11,7	24,7

To achieve a uniform distribution of water to be treated on the filter surface is disposed a horizontal concentric pipe system with 6 mm holes

The power flow through the filter was maintained at 0.8 m<sup>3</sup>.d<sup>-1</sup>, sharing the power in six doses that were administered every 3 hours, five days a week. Hydraulic and organic loads applied were kept in 40 l m<sup>-2</sup> d<sup>-1</sup> and 2,4 g DBO<sub>5</sub> m<sup>-2</sup> d<sup>-1</sup>, respectively.

To monitor the performance of the filter was determined weekly in their effluents and the impoundment of the main parameters which includes the RD 1620/2007: Suspended Solids, Turbidity, Escherichia coli and nematode eggs. In addition, we also analyzed the content of organic matter (BOD<sub>5</sub>, COD). Laboratory tests were conducted following the guidelines of Standard Methods (APHA / AWWA / WEF, 2005).

#### Results an discussion

Table 2 shows the mean characteristics of the effluents from the impoundment and the filtration step during the study period

*Table 2. Characteristics of effluents from the Impoundment and Intermittent Sand Filter*

	TSS (mg/l)	Turbidity (NTU)	E,Coli (UFC/100 ml)	Helminths eggs (n°/20 l)	BOD <sub>5</sub> (mg/l)	COD (mg/l)
Effluent impoundment	92	49	610	0	56	209
Effluent Sand Filter	3	2	38	0	3	54
Performance (%)	96,7	95,9	93,7	-	94,6	74,1
Deviation (%)	12,6	7,8	5,9	-	3,0	12,0

It is noted that the filtration step allows a significant reduction in values of key parameters that are covered by Royal Decree 1620/2007, noteworthy, also, the high performance in the reduction of BOD<sub>5</sub>.

Cycle duration was three months, with a volume of reclaimed water for about 50 m<sup>3</sup>.

## Conclusions

From the first results obtained under the research project "Wastewater Reuse by using conventional technologies, it can be concluded that the use of a sand filter, implanted in the tail of a system of impoundment, as a technology regeneration, and operating with hydraulic and organic loads of 40 l m<sup>-2</sup> d<sup>-1</sup> and 2,4 g DBO<sub>5</sub> m<sup>-2</sup> d<sup>-1</sup>, respectively, produces reclaimed water to satisfy the requirements for most applications referred to in Royal Decree 1620/2007 of 7 December, establishing the legal framework for the reuse of treated water

Research will continue to modify the operating conditions of Sand Filter and feeding with effluent from other treatment technologies,

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